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For related information see also *Astronautics*.

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90 ASTROPHYSICS 1309
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1309
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1309
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1310
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1310

Note: N.A. means that no abstracts were assigned to this category for this issue.

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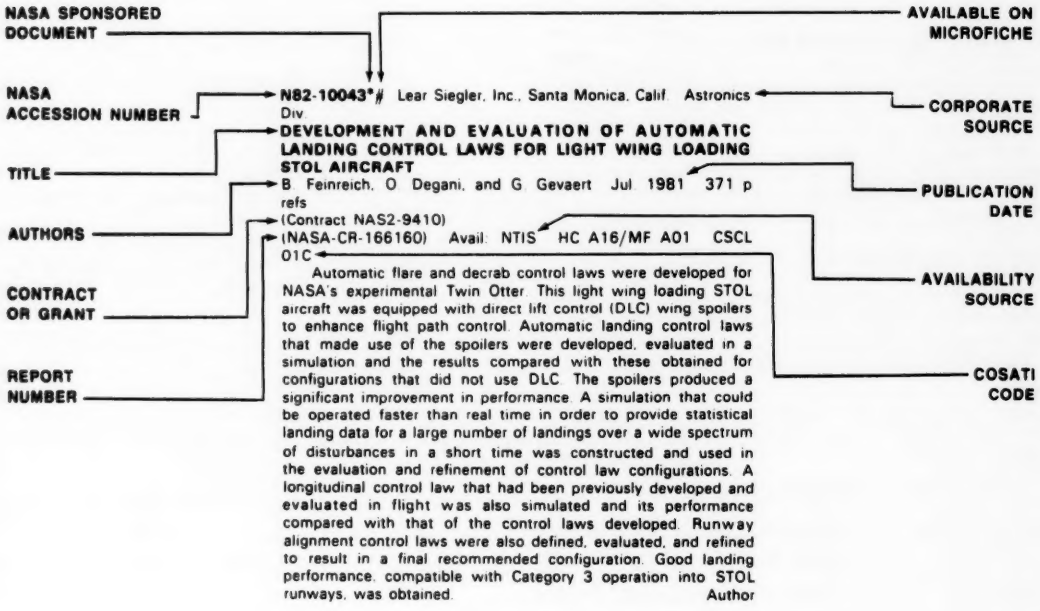
TYPICAL CITATION AND ABSTRACT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N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
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AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
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(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained.
Author

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Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-18119# Deutsche Gesellschaft fuer Luft- und Raumfahrt, Cologne (West Germany).
SEVENTH EUROPEAN ROTORCRAFT AND POWERED LIFT AIRCRAFT FORUM
1981 951 p refs Proceeding of Conf. Held in Garmisch-Partenkirchen, West Germany, 8-11 Sep. 1981 Original contains color illustrations
Avail: NTIS HC A99/MF A01

Aspects of helicopter and turbine rotor are addressed. For individual titles, see N82-18120 through N82-18173.

N82-18120# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
DEVELOPMENTS IN ROTARY WING AIRCRAFT AERODYNAMICS **c02**
I. C. Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 27 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Developments in helicopter aerodynamics are reviewed, including new blade sections and planforms. Computer modelling of the flow and the need for further work in predicting oscillating loadings are considered. The greater attention being given to the need to reduce drag in forward flight due to extended range and fuel conservation costs is recognized. A forecast of advances is made. N.W.

N82-18121# Massachusetts Inst. of Tech., Cambridge.
A SIMPLIFIED APPROACH TO THE FREE WAKE ANALYSIS OF A HOVERING ROTOR **c02**
R. H. Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Rotor wake geometry and the number of blades are analyzed. Simplified approaches to the free wake aerodynamic analysis of hovering rotors permitting rapid evaluation of rotor aerodynamic characteristics are discussed. Analytical results are compared with existing measurements of blade bound circulation and wake geometry. N.W.

N82-18122# Politecnico di Milano (Italy). Instituto di Ingegneria Aerospaziale.
AN EXPERIMENTAL ANALYSIS OF THE SHAPE OF A ROTOR WAKE **c02**
Sergio DePonte and Luigi Vigevano *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 8 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Although the shape of a rotor wake may be described by potential flow methods, to get reasonable calculation costs it is necessary to introduce some simplification in the calculations. In order to check the accuracy and the validity field of the various assumptions a set of experimental data may be a good tool for comparisons. A hot wire technique to detect the presence of the blade wake is presented. N.W.

N82-18123# Tokyo Univ. (Japan).
AN EXTENSION OF THE LOCAL MOMENTUM THEORY TO THE ROTORS OPERATING IN TWISTED FLOW FIELD **c02**
Akira Azuma, Ken-ichi Nasu, and Takatoshi Hayashi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The local momentum theory was developed to calculate the dynamic airloading of a helicopter rotor, where the velocity perpendicular to the plane of rotation was assumed to be negligibly low in comparison with the rotating velocity. In the case of propellers or windmills, however, this assumption is no longer adequate, and the flow field seen in the rotor-fixed-coordinate system is noticeably twisted along the span. In order to permit calculation of the induced velocity distribution as well as the airloading of the blade in such a twisted flow field, we have carried out an extension of the local momentum theory. Since our method of calculation is based on the instantaneous circulation distribution rather than the instantaneous momentum balance, it may be called the Local Circulation Method. The present method is also applicable to propellers and windmills in yawed flow. Author

N82-18124# Nanjing Aeronautical Inst. (China).
A SIMPLIFIED METHOD FOR PREDICTING ROTOR BLADE AIRLOADS **c02**
Wang Shi-cun and Xu Zhi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 28 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Relations of first two harmonic induced velocities to the lower and same-order harmonic circulations are obtained from the generalized classical vortex theory of the rotor. Then, based on the blade element theory, a closed form of equations for circulation is established and, by taking the flapping condition into account, simplified formulae for predicting rotor blade airloads are set up. In particular, expressions of flapping coefficients are derived, including the effect of variable induced velocity distribution but in terms of blade parameters and flight parameters only. Finally, a calculation of a typical example is made and comparisons of airloads with those from the more accurate numerical solution are shown that the present method is fairly suitable for aerodynamic analysis and preliminary design of helicopters. Author

N82-18125# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
A THREE-DIMENSIONAL APPROACH TO LIFT AND MOMENT COEFFICIENTS OF ROTATING BLADES **c02**
Wolfgang Send *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

The three dimensional incompressible flow around a thick blade is calculated in the limiting case of an infinitely high Reynolds number. The solution for a four bladed rotor is achieved by interacting the mutual influence of the induced velocities on the blades. Several properties of the three dimensional approach are compared with two dimensional theories. Unsteady results are obtained by combining the quasi-steady flow with the calculation for a given oscillation mode. The integral equation for the flow around the blades is solved by a higher order panel technique for the vorticity vector, continuous on the blade and downstream in the wake. An improper description of the wake integral is evident. The helical wake is substituted by its rectilinear counterpart, for which an analytical description was found. N.W.

N82-18126# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

A COMPLETE METHOD FOR COMPUTATION OF BLADE MODE CHARACTERISTICS AND RESPONSES IN FORWARD FLIGHT **c05**

J. P. Lefrancq and B. Masure *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 9 p (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

Hypotheses and equations, methods of calculation, and numerical adaptation concerning the dynamics of helicopter rotors are dealt with. Two problems raised by a spinning rotor are also dealt with: determination of natural models qualified by their eigen frequency and damping; and forward flight, using the azimuth method which avoids those difficulties inherent to the modal methods. The calculation process used to improve a rotor while at design stage is illustrated. N.W.

N82-18127# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.

MODAL CHARACTERISTICS OF ROTOR BLADES: FINITE ELEMENT APPROACH AND MEASUREMENT BY GROUND VIBRATION TEST **c05**

D. Ludwig *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

The mass and stiffness matrices for a rotating blade are established by the finite element method. The formulation is based on the Lagrange function for combined flapwise bending, chordwise bending, and torsion of twisted nonuniform rotor blades. The element matrices are created by the non-numeric computer program REDUCE. An ordering scheme was introduced to demonstrate which terms may be simplified or neglected. As examples, eigen analyses, with the finite element computer program, are performed for a homogeneous beam and for the nonrotating blade of a wind energy converter. The results of the calculations for the beam are compared with the analytical solutions. The rotor blade of the wind energy converter was tested in a ground vibration test. A short description of the ground vibration test technique and performance is given. N.W.

N82-18128# Hochschule der Bundeswehr, Munich. (West Germany). Inst. fuer Luftfahrttechnik und Leichtbau.

DYNAMIC AND AEROELASTIC CHARACTERISTICS OF COMPLETE WINDTURBINE SYSTEMS **c02**

E. W. Steinhardt *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

For the investigation of the dynamic and aeroelastic characteristics of large horizontal axis windturbines, a hybrid model consisting of rigid bodies and flexible continuous structures was developed. Degrees of freedom include tower bending and torsion, pitch and yaw of the nacelle as well as rotation, inplane and out-of-plane bending of the blades. Aerodynamic forces are introduced with special regard to motion-induced effects and on gusts. A set of partial integro-differential equations was established via the principle of virtual work. The application of Galerkin's extended method gives a system of linear periodic differential equations. The numerical results confirm strong rotor-tower-coupling and illustrate the typical features of periodic systems. Instationary aerodynamic terms are found to be of minor importance and hingeless rotors will be damped better than teetering rotors, but tower and blade reactions to gravity and gusts are higher. Author

N82-18129# Westland Helicopters Ltd., Yeovil (England). Dynamics Dept.

A STUDY OF THE TECHNIQUES OF DYNAMIC ANALYSIS OF HELICOPTER TYPE STRUCTURES **c05**

G. M. Venn and D. J. Boon *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

The techniques used in the dynamic analysis of helicopter type structures using finite elements are discussed. A test structure was designed and built which incorporated many design features found in helicopter structures. Experiments were performed on this structure to determine the natural frequencies and normal modes. These experimental results were compared with theoretical finite element results. Altering the build state added one or two extra problems so that these could be studied. The modelling problems investigated were: riveted panel-stringer constructions, deep fabricated beams, discontinuous load paths, bolted joints, honeycomb panels, gearboxes, engine mounts, and engines. The techniques used to model these features are discussed. Problems were found when attempting to compare the theoretical and experimental results. N.W.

N82-18130# Virginia Polytechnic Inst. and State Univ., Blacksburg.

THE EFFECTS OF SLIGHT NON-LINEARITIES ON MODAL TESTING OF HELICOPTER-LIKE STRUCTURES **c05**

D. J. Ewins (Imperial College of Science and Technology) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 11 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

A comprehensive series of modal tests was made on a specially built test piece designed to simulate many of the characteristics of helicopter structures. These tests identified the presence of a 'slight' degree of nonlinearity and further established that this almost unnoticed effect causes significant discrepancies in the modal properties deduced from measured data. However, systematic analysis of the measurements may be used to isolate the nonlinear effects and to eliminate them from the results. Author

N82-18131# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.

PARAMETRIC STUDY OF THE INFLUENCE OF THE ENGINE UPON THE OPERATING COST OF A CIVIL HELICOPTER **c83**

Gilbert Beziac, Jean-Pierre Dedieu, and Philippe Cabrit *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 5 p (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

The influence of engine characteristics (weight, fuel consumption, price, power range) upon the helicopter operating cost were studied. The parametric relationship between the various factors were defined. Several engine alternatives for a medium weight helicopter were compared. The following conclusions were made: (1) a sufficient power reserve is necessary but too high a value is not profitable; (2) the fuel consumption should be the result of a compromise: interest of a low value, engine complexity, reliability; and (3) a substantial increase in helicopter cost effectiveness is obtained thanks to a simultaneous evolution of aircraft and engine. M.D.K.

N82-18132# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

PREDICTION OF OFF-DESIGN PERFORMANCE OF TURBO-SHAFT ENGINES A SIMPLIFIED METHOD **c07**

H. Wittenberg *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

Estimation of the off-design performance of a given gas turbine is generally based on detailed performance characteristics

of compressor and turbine(s). An approximate method for the estimation of the off-design behavior of turbojet and turbofan engines was developed using thermodynamic relationships only. The method is based on a matching procedure with generalized mass flow characteristics of the turbine(s) or exhaust nozzle(s). The method was adopted to turbo-shaft engines for this study. Examples are given for an actual engine type. There is fair agreement between the calculated off-design performance and the data derived from the manufacturer's engine brochure.
M.D.K.

N82-18133# Rolls-Royce Ltd., Watford (England).
MEASUREMENT TECHNIQUES USED TO ASSESS THE INSTALLED POWER OF A HELICOPTER ENGINE c07
T. G. Morton *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p Original contains color illustrations (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

To improve helicopter performance predictions, it is important to quantify any change in engine performance between the test bed and 'as installed' in the aircraft, and to attribute the reasons for any change as accurately as possible. Measurement techniques used to quantify performance for a particular Rolls-Royce Gem Engine installation is discussed. Extra sensors were added to engines in a production Lynx helicopter which was fitted with recorder equipment in the cabin and flown to a defined schedule. If the engine is considered as a thermodynamic unit, the input/output equation must balance. Test point data based on these inlet and exhaust conditions were obtained from both test bed and flight tests. Analysis of results when compared to a thermodynamic model of the engine, shows that the resultant data is very sensitive to the quality of measurements and will quickly show the deviation from predicted characteristics. Author

N82-18134# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
COMPONENT DESIGN AND DEVELOPMENT FOR FUTURE HELICOPTER ENGINES c07
Jean Hourmouziadis and Horst B. Kreiner *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Advances achieved today and results available from both rig and demonstrator test programs for present and future helicopter engines are discussed. These will form the basis for further component improvement required to yield a successful next generation engine. The significance of reduced fuel consumption, improved overall system performance, and reliability are considered in relation to design activity and reaction to changing customer needs. M.D.K.

N82-18135# General Electric Co., Cincinnati, Ohio. Systems and Controls.
THREE-ENGINE CONTROL SYSTEM FOR THE PROTOTYPE EH-101 HELICOPTER c07
E. A. Chiuchiolo and J. J. Curran *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft 1981 10 p refs (For primary document see N82-18119 09-01)
(AEBG-9/81-1568L) Avail: NTIS HC A99/MF A01

The T700 control system configured for installation in the three-engined WG.34A helicopter (prototype for European Helicopter Industries EH-101) provides for a versatile control system which may be operated normally to provide the helicopter propulsion or may be operated as a totally independent system to power airframe avionics and power accessories. It is designed to maintain constant speed for accessories or load share with second and third engines and is independent of position in the aircraft. The total system is automatic and provides not only constant rotor speed but also closely matched torques. Modifications made to the T700 control system to provide the above capabilities are discussed. Discussion of the need for these modifications and the present status of the design is also designed. Author

N82-18136# I.A.M. Rinaldo Piaggio, Finale Ligure (Italy).
ENGINE SUPERFICIAL TEMPERATURE AND INFRARED SIGNATURE c07
A. M. Ricci, A. N. Allavena, and W. Esposti (I.C.I.T.E., S. Giuliano Milanese, Italy) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

A system calibration and data processing method was set up to provide spatial information on temperature and a spatially accurate radiant intensity map under different angles. The methodology was developed to evaluate the thermal exchange between engine and engine-cowling and their infrared signature in the 1 - 6 micrometer range in order to evaluate special infrared treatment to reduce infrared emission. The infrared imagery camera was coupled to an analogic/digital data acquisition system. Calibration studies were conducted in an infrared laboratory to provide the absolute calibration on the thermograph in the previously defined spectral range. The results are presented in profiles of temperature and radiance. Author

N82-18137# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
POINT OF VIEW OF A HELICOPTER MANUFACTURER ON AIRWORTHINESS REGULATIONS
Jean Boulet *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 5 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Helicopter airworthiness regulations are discussed. The need for airworthiness regulations to be drafted and modified through a process of constant consultation between Civil Aviation Authorities and manufacturers is discussed. The need to introduce the concept of probability to be able to come closer to the actual risks and to avoid penalizing aircraft with useless systems and demonstration requirements is also considered. It is suggested that these regulations tend toward one single international set of regulations and one single demonstration of compliance with the regulations. The possibility of reconciling a continuously improved safety level and a progressive reduction in helicopter costs is also considered. M.D.K.

N82-18138# Italian Army General Staff, Rome.
MILITARY REQUIREMENTS: TOO LITTLE OR TOO MUCH
Emidio Valente *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Concepts useful for a better understanding of the military requirements, operational requirements for helicopters are discussed. The need for an understanding between military operators of rotary-wing aircraft, helicopter designers, and manufacturers is considered. Two viewpoints are summarized: (1) The helicopter is a weapon system featuring the same indispensability level of all other systems required to integrate the battlefield. (2) The helicopter must be designed to reflect military requirements which cover all those elements likely to condition its operation, this is to say: operational environment, human factor, and economical aspects. The following considerations are recommended for further investigation: (1) whether commercial operators are really affected and (2) whether solutions can be found which in the end prove to be a saving rather than a deterioration in cost, weight and complexity. M.D.K.

N82-18139# Italian Air Force Pratica di Mare, Rome. Flight Test Centre.
PARAMETRIC CRITERIA AND IMPACT ON DESIGN TRENDS c05
Roberto dePompeis and Fulvio Gagliardi (Ministry of Defence) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Laws or trends of typical parameters which contribute to the definition of an 'ideal' specific helicopter which can be used as a reference model and give a nondimensional measure of effectiveness are discussed. Operative requirements, taking into account the main factors affecting missions were transferred into a mathematical model. The procedure was derived from theoretical studies already applied to aircraft selections and consists of three main steps: (1) Effectiveness program; (2) Total operating cost estimation; and (3) Evaluation of effectiveness-cost ratio and

optimization of the fleet selection. All costs (manufacturing, maintenance, training, operating, etc.) for the operative life are estimated with a similar methodology and lead to the determination of the effectiveness-cost ratio which may be optimized taking into account the fleet consistency required to fulfill the task.
M.D.K.

N82-18140# Hughes Helicopters, Culver City, Calif.
DESIGN PHILOSOPHY OF THE HUGHES MODEL 600 HELICOPTER **c05**
R. S. Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The design philosophy of a new model helicopter, the Hughes model 600X, which took into consideration a number of factors is discussed. The following subjects are discussed and a rationale for the selected approach is given: (1) whether to grow or develop a totally new configuration. To be cost effective, a growth helicopter would need to produce significant additional advantages which would be offset by the ever present compromises of the old design; (2) how to grow an 'egg', especially one with internal structure; (3) how to replace the old model or is the new model to be produced in addition to the old one; and (4) how is the market potential to be assessed. Details of approaches are presented with reasons for accepting or rejecting each one. Results of market analysis and response of the helicopter public is presented to show the viability of the selected configuration.
M.D.K.

N82-18141# United Technologies Corp., East Hartford, Conn. Aircraft Div.
SH-60B TEST PROGRAM **c05**
Frederick J. Silverio *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The SEAHAWK Program, a successful helicopter development program, is discussed in detail. The following program tests are described: modifications for shipboard compatibility and mission requirements; preflight ground tests; flight and shakedown testing; evaluation of the pitot-static system and digital computer system; reliability tests and component systems analysis. Failure modes not detected in flight tests or qualifications bench tests, but discovered in testing under service use, are discussed. M.D.K.

N82-18142# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
NAVAL VERSIONS OF THE DAUPHIN AND THE AS 15 TT WEAPON SYSTEM **c05**
J. P. Dubreuil *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 10 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Aerospatiale's Dauphin II helicopter family, initially intended to satisfy civil market demand, is presently subject to development that makes it possible to derive military versions from it. The equipment specific to naval versions whose basic system is the AS 15 TT is discussed in detail. All the arrangements and modifications that were necessary to adapt the N aircraft to naval, rescue and attack missions and which led to the SA 365 F version are discussed. The AS 15 TT and surface vessel system are described in detail. The modifications which affected almost all the constitutive elements and aimed at improving not only performance but also maintenance led to a reduction in fabrication and operation costs. M.D.K.

N82-18143# Westland Helicopters Ltd., Yeovil (England).
ARMY LYNX: PRODUCT DEVELOPMENT MATCHED TO MILITARY COMBAT DEVELOPMENT **c05**
D. A. S. Howell *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The Lynx helicopter program to date and planned product development related to the evolution of military combat thinking especially the anti-armour role are presented. The background for this product development is the impact of technology in the areas of materials, sensors, armaments and systems, both in the context of the helicopter as a total weapon system and the development of air defense systems that pose a threat to the helicopter in the battlefield scenario. Author

N82-18144# Societe Nationale Industrielle Aerospatiale, La Courneuve (France).
A LIGHT HELICOPTER FOR NIGHT FIRING **c05**
J. F. Candau *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Structural design criteria and armament system requirements for a flight combat helicopter for night firing are discussed. Helicopter characteristics and performance requirements for night time antitank missions are considered. The following areas of consideration are discussed: piloting, navigation, target seeking, and firing. Operational use, crew organization, and program development are also reviewed. M.D.K.

N82-18145# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
TETHERED ROTORPLATFORMS AND THEIR MISSION POTENTIAL **c05**
W. Goeller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

A definition of tethered rotorplatforms is given and the main objectives that are pursued with these vehicles are presented. A short retrospect on rotorplatform history is given. The Dornier 'Kiebitz' is described. It is designed to lift payloads for battlefield surveillance, air defense, EW or communication to some hundred meters above ground for long mission times. A very small tethered rotorplatform for elevating electro optical sensors of 5 to 10 kg is described. The energy for its flight time of about 70 seconds is stored in a massive momentum ring surounding its rotor. Finally, a proposed rotorplatform with an electric drive system for payloads of about 30 kg for target acquisition and target designation, is also discussed. M.D.K.

N82-18146# Southampton Univ. (England).
WIND TUNNEL INVESTIGATION OF HIGH SPEED ROTOR NOISE **c71**
H. Tadghighi and I. C. Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

A high speed model rotor (tip Mach number of 0.75) was developed to investigate tail rotor noise in forward flight conditions. The existing 2.1 by 1.5 m low speed (30 m/sec) closed circuit wind tunnel was modified and utilized to enable acoustic measurements of forward flight to be made. Check tests in the 24 ft anechoic wind tunnel show excellent agreement with the development tests. The model rotor noise data are found to correlate well with full scale helicopter rotor values. Simultaneously recorded aerodynamic performance of the model rotor (blade loading, steady thrust, torque and trimmed moments) is compared with theoretical aeroacoustic treatments. It is concluded that the model rotor accurately simulates full scale rotor aeroacoustic data. J.M.S.

N82-18147*# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
PREDICTION OF BLADE VORTEX INTERACTION NOISE FROM MEASURED BLADE PRESSURE **c02**
Yoshiya Nakamura *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 20 p refs Sponsored by NASA (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01 CSCL 01A

The impulsive nature of noise due to the interaction of a rotor blade with a tip vortex is studied. The time signature of this noise is calculated theoretically based on the measured blade surface pressure fluctuation of an operational load survey rotor in slow descending flight and is compared with the simultaneous microphone measurement. Particularly, the physical understanding of the characteristic features of a waveform is extensively studied in order to understand the generating mechanism and

to identify the important parameters. The interaction trajectory of a tip vortex on an acoustic planform is shown to be a very important parameter for the impulsive shape of the noise. The unsteady nature of the pressure distribution at the very leading edge is also important to the pulse shape. The theoretical model using noncompact linear acoustics predicts the general shape of interaction impulse pretty well except for peak amplitude which requires more continuous pressure information along the span at the leading edge. Author

N82-18148# Westland Helicopters Ltd., Yeovil (England).
PRELIMINARY THOUGHTS ON HELICOPTER CABIN NOISE PREDICTION METHODS **c71**
J. S. Pollard *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The problems of predicting helicopter cabin noise are discussed with particular reference to the Lynx helicopter. Available methods such as modal analysis adopted for propeller noise prediction do not cope with the higher frequency discrete tone content of helicopter gear noise, with the airborne and structure-borne noise contributions. Statistical energy analysis methods may be the answer but until these are developed, one has to rely on classical noise transmission analysis and transfer function methods. Author

N82-18149# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
THE MEASUREMENT OF THE MOBILITY OF STRUCTURES AT ACOUSTIC FREQUENCIES **c39**
Susan M. Damms *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The development of a technique to measure the response of structures to vibrational input forces and moments is described. So far, simple structures with known properties have been used but it is intended to apply the technique in the design of an interface which isolates vibrationally the gearbox of a helicopter from the cabin at acoustic frequencies. In a first experiment, no moments were applied. The main object was to demonstrate that measurements could be made on two components of a structure with sufficient accuracy to correctly predict measurements on the assembled structure. The two components were a beam and a dynamic absorber. In a second experiment a special block was attached to a beam to enable forces and moments to be applied and translations and rotations to be measured. The particular mobilities measured were chosen so that they could be easily compared with theory and also with measurements without a block. J.M.S.

N82-18150# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
FLIGHT CHARACTERISTICS DESIGN AND DEVELOPMENT OF THE MBB/KHI BK117 HELICOPTER **c05**
H. Huber and T. Masue (Kawasaki Heavy Industries) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The BK 117 light, twin-engine helicopter was designed to provide high flexibility of operations, attractive performance characteristics, and outstanding handling qualities. Dominant features result from the hingeless rotor system, which provides inherent high control power and high angular velocity damping. Further optimization is achieved through refinement of the fuselage aerodynamic design, and by a proper layout of the empennage configuration, taking into account the interactional aerodynamic phenomena. The particular design features and their impact on the helicopter flight characteristics are described. The results obtained in the areas of static and dynamic stability (longitudinal, lateral directional), control response and maneuver characteristics, aeromechanical stability and loads and vibrations are presented, including correlation of flight test data with computer model simulations. J.M.S.

N82-18151# Politecnico di Milano (Italy). Dipartimento di Ingegneria Aerospaziale.
A GENERAL PURPOSE PROGRAM FOR ROTOR BLADE DYNAMICS **c05**
M. Borri, M. Lanz, and P. Mantegazza *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

A computer program for rotor blade dynamics capable of dealing both with hinged and hingless rotors, suitable for steady state flight analysis and stability evaluation was developed. Blade motion is represented by finite elements in the space-time domain, covering the span of one or more rotor revolutions, and allowing for different nonlinearities. This method gives a flexible unitary approach for the very different model complexities required by the different design phases, such as the simplest rigid blade schemes, and the more sophisticated ones including nonlinearities arising from large blade flexibilties and large movements in control links. The aerodynamics, at the present development state, considers prescribed wake geometry and blade element theory, including stall and compressibility effects. J.M.S.

N82-18152# Hindustan Aeronautics Ltd., Bangalore (India). Helicopter Design Bureau.
AUTOMATIC GENERATION OF EQUATIONS FOR ROTOR-BODY SYSTEMS WITH DYNAMIC INFLOW FOR A PRIORI ORDERING SCHEMES **c02**
J. Nagabhushanam, G. H. Gaonkar (Indian Inst. of Science), and T. S. R. Reddy (Indian Inst. of Science) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 37 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

In helicopter dynamics research with interpretive models, the process of manually deriving state equations for a priori ordering schemes is tedious and of limited reliability. The feasibility of its computerization by a completely self contained symbolic processor in FORTRAN 4 is discussed. The symbolic manipulation details are presented for a coupled rotor-fuselage system with dynamic inflow in forward flight. The coupled system refers to a rotor with rigid blades executing lag and flap motions and to a fuselage idealized as a simple rigid body executing roll and pitch motions. The feedback from dynamic inflow refers to a first-order model based on an unsteady actuator-disk theory. The use of such a processor offers considerable promise in that for an adequate model representation, state equations can be generated for a priori ordering schemes as required in stability, vibration and combined stability and vibration analyses. Author

N82-18153# National Aerospace Lab., Amsterdam (Netherlands).
A CONTROL MODEL FOR MANEUVERING FLIGHT FOR APPLICATION TO A COMPUTER-FLIGHT TESTING PROGRAM **c08**
H. Haveridings *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

A computer-flight-testing (CFT) program for helicopters to evaluate helicopter dynamics and handling and control qualities is described. The nonlinear six degrees of freedom helicopter model is driven by control inputs generated by a specially developed control model (or 'pseudo pilot') to eliminate problems in estimating control inputs during maneuvering flight. This is an adaptation of a linear optimal control model as used in human factor analysis. The helicopter model is based on two-dimensional strip aerodynamics steady-state rotor blade dynamics using only out-of-plane bending mode shapes, which are suitable for various types of rotor articulation. The 'pilot' model consists of a flight path generation (FPG)-model and a stabilitization (STAB)-model. The FPG-model is based on linearized system dynamics using terminal optimal control, generating both required flight path and the control inputs to achieve it. These controls are input into the helicopter model. The two flight paths are compared, and differences are fed back to the STAB-model to generate corrective control inputs of such a nature that the helicopter-model-generated flight path tracks the required flight path generated by the FPG-model. Also the STAB-model is based on linearized system dynamics. As an example, two flare maneuvers are 'flown', and the results discussed. The pseudo-pilot model performs well, provided that helicopter dynamics do not change much during a specific maneuver. J.M.S.

N82-18154# Westland Helicopters Ltd., Yeovil (England).
THE ROLE OF SIMULATION IN THE DESIGN PROCESS **c05**
I. F. Montgomerie and G. C. F. Wyatt *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Real-time simulation of helicopters and their avionic systems is discussed. The nature of the problems facing the helicopter and systems designers are reviewed, and the potential benefits accuring from the timely and effective use of simulation are examined. The development of simulation as a design tool over the last two decades are reviewed, and the characteristics of the simulation facilities are described. J.M.S.

N82-18155# Royal Aircraft Establishment, Farnborough (England).
PRELIMINARY INVESTIGATION INTO THE ADDITION OF AUXILIARY LONGITUDINAL THRUST ON HELICOPTER AGILITY **c05**
P. J. Legge, P. W. Forestcue (Southampton Univ.), and P. Taylor (Southampton Univ.) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The agility requirements in specific maneuvers performed by military helicopters are investigated. A simple mathematical simulation of the helicopter accelerating and decelerating longitudinally is used to examine the advantages of auxiliary thrust. For helicopters operating in the Nap-of-Earth environment the longitudinal acceleration and deceleration performance is shown to be uniquely important. Large improvements in agility, measured by a performance function, are obtained by adding auxiliary thrust. The need for the helicopter to change its attitude is drastically reduced, and the pilot workload improved. The type of flight profile used is also examined, using a nondimensional Froude number. There was no benefit in a 'maximum effort' flight profile, which consequently further improves the pilot workload. Auxiliary thrust improved agility performance by increasing the helicopter's ability to change position while maintaining precise attitude control. J.M.S.

N82-18156# National Defence Academy, Yokosuka (Japan). Dept. of Aeronautical Engineering.
OPTIMUM PERFORMANCE AND WAKE GEOMETRY OF CO-AXIAL ROTOR IN HOVER **c05**
Tomoari Nagashima and Kenji Nakanishi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Numerical studies to clear out the rotor-wake interference effects on the optimum performance and wake geometry of a coaxial rotor in hover are performed using the generalized momentum theory and the simplified free wake analysis. For applying the momentum concept to the performance predictions of the coaxial rotor system, each wake of rotors and flow fields around them are modeled so as to properly incorporate wake contractions, rotational velocities, and nonlinear mutual interference effects. In case of the free wake analysis, it is approximated by a finite number of discrete circular vortices whose numbers and core radii are deduced from the sensitivity analysis. The numerical results clearly show that the performances and its wake geometries are largely dependent on the axial spacings and the pitch differences between rotors and there are unique combinations of them which could produce the optimum performance. It is also understood that the upwash effect of the contracted upper rotor wake on the lower rotor plays a fundamental role to improve the hover performance with coaxial rotor arrangement. Author

N82-18157# Tokyo Univ. (Japan). Inst. of Interdisciplinary Research.
A NUMERICAL APPROACH TO CO-AXIAL ROTOR AERODYNAMICS **c02**
Shigeru Saito and Akira Azuma *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

In the simple momentum theory, the aerodynamic characteristics of the lower rotor of a coaxial rotor system are usually evaluated under the highly deteriorated conditions caused by the fully developed wake of the upper rotor, specifically under the conditions of hovering flight. Analysis using the Local Momentum Theory not only shows the performance of the lower rotor to be higher than that calculated by the simple momentum theory but also makes it possible to calculate the instantaneous airloading of blades operating in a complex wake system. By introducing the radial shrinkage of the rotor wake, the accuracy of the analysis of blade airloading is further improved. The calculated results are compared with those of wind tunnel tests in both hovering and forward flights. In forward flight, the performance of the lower rotor improves not only with increases in the forward speed but also with increase in the vertical distance between the upper and lower rotors. In hovering flight, the improvement in the performance is not remarkable because the lower rotor is strongly influenced by the upper rotor wake.
Author

N82-18158# Institut fuer Flugmechanik, Brunswick (West Germany).
HELICOPTER ROTOR DOWNWASH: RESULTS OF EXPERIMENTAL RESEARCH AT THE DFVLR-ROTOR TEST STAND AND THEIR COMPARISON WITH THEORETICAL RESULTS **c02**
B. Junker and H.-J. Langer *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

System tests and dynamic researches at the rotor test stand were compared with several downwash measurements to demonstrate the dependency between mathematical parameter values and rotor control values, e.g., thrust, advance ratio, and control angles. For comparisons mathematical models like the local momentum theory, and a fixed vortex model were applied. For these experiments a four bladed hingeless rotor and a two bladed See Saw rotor with an advance ratio of up to mu = 0.2 were used. Numerous tests were performed to study the flow field of rotor downwash in different wind tunnels. The measuring equipment for the downwash was set up on both sides of the rotor stand. So it was possible to receive two values at the same time. At first pneumatic probes were applied, that gave acceptable mean values, and then hot-wire probes in X-configuration were used to investigate downwash dynamics in more detail. Measurements were conducted in the x-z-plane. Wind tunnel test results, correlation to the mathematical models, and errors are discussed. J.M.S.

N82-18159*# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
HOVER TESTS OF A MODEL H-FORCE ROTOR **c05**
H. R. Velkoff *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
(Contract NCA2-OR565-001)
Avail: NTIS HC A99/MF A01

The potential of using tip vanes at the ends of helicopter rotor blades to obtain a controllable H-force is considered. The addition of vanes placed perpendicular to the blade tips can be used to obtain an inplane force. By varying the angle of the vanes, a radial force can be created which can be controllable in azimuth position. Such a force could be used to provide translational motion of the rotor and aircraft without the requirement for rotor tilting. In addition, an H-force generated at high flight speed could be used as a propulsive force in a matter similar to a propeller. The force generated by the vanes could also affect the aircraft's stability characteristics. The H-force could also modify rotor performance in hovering since they could be thought to act as a virtual shroud. Tests were run with a model rotor which has a 6 foot diameter with a 3 inch chord blade. Test data are presented on the effects of various tip-vane configurations on the hovering figure of merit. The extreme sensitivity of the performance to vane arrangement is shown.
Author

N82-18160# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

THE PROBLEM OF CALCULATION OF THE FLOW AROUND HELICOPTER ROTOR BLADE TIPS c02

H. Stahl *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

There are special problems with the theoretical analysis of the flow around helicopter rotor blade tips that are based on the fact that the flow is three dimensional, unsteady, rotational, and on the advancing blade in fast forward flight also transonic. Theories for this problem based upon potential flow theory are presented. Calculations show that this approach can lead to a sufficient discription of the actual flow. Computer programs for the three dimensional steady and the unsteady two dimensional flow past fixed wings were modified for rotating rotor blades. Results are shown. T.M.

N82-18161# Office National d'Etudes et de Recherches Aeronautiques, Paris (France).

APPLICATION OF THE ONER DYNAMIC STALL MODEL TO A HELICOPTER BLADE IN FORWARD FLIGHT c05

C. T. Tran and D. Falchero (SNIAS, Marignane, France) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 26 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

The model was applied to the case of a helicopter rotor system in forward flight. Aspects of stability and periodic response are described and include: the form of the Floquet modes-subharmonic oscillation and almost periodic oscillation; the evolution of these modes as functions of the rotor advance ratio; the periodic response and aerodynamic force and moment; and a comparison with a quasi-steady aeroelastic calculation showing the effects of unsteady phenomena. T.M.

N82-18162# Royal Aircraft Establishment, Farnborough (England).

SOME UNSTEADY AERODYNAMIC EFFECTS ON HELICOPTER ROTORS c02

P. G. Wilby, M. J. Riley, and Judith Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

Unsteady effects have an important influence on the aerodynamic loading experienced by a helicopter rotor in forward flight. These effects include dynamic stall characteristics with the associated stall delay and large nose-down change in pitching-moment. All unsteady effects must be taken into account when predicting rotor loads, performance and flight envelope. However, the full unsteady effects on the rotor result from simultaneous oscillatory variations of both incidence and Mach number, and it is difficult to study these effects in isolation from the rest of the rotor environment. Empirical methods for modelling these effects, especially dynamic stall characteristics, were developed and incorporated in the rotor loads prediction methods. Results from a program of work involving oscillatory aerofoil tests, flight experiments and unsteady aerodynamic prediction methods are presented. T.M.

N82-18163# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

SEPARATED FLOW AROUND HELICOPTER BODIES c02

G. Polz and J. Quentin *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

On the rear part of the helicopter fuselage, flow separation is often unavoidable owing to the shape of the afterbody which is often defined more in accordance with operational requirements (for example cargo door) and with only minor consideration to aerodynamic aspects. Because of the separated flow, an analytical calculation of the flow field using potential flow theory is not possible. After an overview about the separated flow phenomena a method is explained based on a combination of panel methods with boundary layer analysis. In this method the wake flow region is represented by a wake body which consists of a uniformly distributed vorticity. Calculated pressure distributions and flow fields are shown in comparison with wind tunnel test results. The main interest lies in the more downstream part of the wake, which is very important for the tail surface and tail rotor effectiveness. Author

N82-18164# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.

A METHOD OF PREDICTING FUSELAGE LOADS IN HOVER c02

P. Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

A computer program called DOWNLOAD was developed in which the fuselage separated flow is modelled using a vortex sheet representation. The vortex sheet model can predict the separated flow pressure distribution provided the separation point is known. Unfortunately, the poor behavior of the vorticity vector in the separation region prevents an accurate prediction of the separation line. DOWNLOAD was applied to three simple fuselage shapes with a simple triangular representation of the rotor downwash. The predicted download values were in the lower region of the figures usually quoted as a percentage of thrust. T.M.

N82-18165# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

IMPACT OF SYSTEMS TECHNOLOGY AND INTEGRATION ON HELICOPTER DESIGN c05

K. Schymanietz *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 20 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

A helicopter design depends on a variety of parameters, criteria and requirements. A new design is generated either by a direct order of a customer or due to industrial investigations in the different fields like market trend studies, application of advanced or new technologies and/or overall efficiency improvements. A complete design includes not only the vehicle design with its main functional groups but also the integration of the systems/equipment concept. In the past a new helicopter design was conducted mainly due to the task for a new vehicle. The fact that - especially in the military field - the impact of systems gets an increasing influence in all design areas, gives an impression of the importance of systems technology and integration in the helicopter design. Future changes in design concepts are considered in terms of the chronological advance in the design of the different system components, new technologies for new systems, e.g., in the field of visionics, and system architecture based on a digital bus connection. T.M.

N82-18166# Army Aviation Research and Development Command, St. Louis, Mo.

REVIEW OF HELICOPTER MAST MOUNTED SIGHT (MMS) BASE MOTION ISOLATION AND LINE-OF-SIGHT (LOS) STABILIZATION CONCEPTS c06

Daniel P. Schrage *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)

Avail: NTIS HC A99/MF A01

Incorporation of a MMS or any precision stabilized pointing system on a helicoper is a complex and interesting dynamic design problem which combines automatic control through a servomechanism with vibration reduction techniques. Generally, the helicopter disturbance inputs to the MMS must be accomodated by a stiffer MMS structure and servo-system. However, weight and cost are usually critical and many benefits could be derived from incorporation of a lightweight vibration isolator. There are important design considerations on both sides of the interface, the airframe and the MMS. A review of these design considerations and several vibration isolation concepts is presented. The need for adequate simulation modeling of this complex dynamic environment is discussed. T.M.

N82-18167# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

MAST MOUNTED VISUAL AIDS c06

R. D. vonReth *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 24 p refs (For primary

document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

Initial flight tests with a spherical mock up, having the same shape, weight and moments of inertia as the actual system were carried out on a Bo 105 with two different rotormast extensions (90 and 120 cm). A vibration survey over most of the Bo 105's flight envelope showed vibrational loads which can be tolerated by the actual system. As a next step the actual stabilized platform with FLIR, TV-camera and laser range finder was installed on the rotormast. In addition several subsystems used for the display of the video images with superimposed symbology are described. For direct comparison purposes three different systems, head up, head down and helmet mounted sight and display were evaluated. The influence of the rotorplane, vibrational loads and meteorological conditions on the performance of the FLIR image is described. T.M.

N82-18168# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

EXPERIMENTAL INVESTIGATION OF VISUAL AIDS FOR HELICOPTERS: LOW LEVEL FLIGHT AT NIGHT AND POOR VISIBILITY **c06**

R. Beyer, E. Danneberg, E. Kohnen, and H. Stein *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The potential and the limitations of advanced display systems for visual aids in helicopters were investigated. A combination of the sensor image and computer generated instrument displays in a head-down display, helmet mounted sight/display and night goggles, were evaluated. The layout of the instrument display is considered assuming transport mission and various display modes are implemented. The visual aids were flight tested in Bo 105 and Bell UH-1D helicopters with particular emphasis on the usefulness of the display modes on flight performance and low level flight performance. T.M.

N82-18169# Litton Systems (Canada) Ltd., Toronto (Ontario). Advance Programs.

THE MULTI MODE MATRIX FLAT PANEL DISPLAY: TECHNOLOGY AND APPLICATIONS **c06**

A. Moffat and P. Wright *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

An important aspect of current developments in advanced cockpit design is the introduction of a small number of interactive multi-function electronic displays with digital data processing, in conjunction with a MIL-STD-1553 type of multiplex data bus in an integrated system as opposed to the conventional approach of large numbers of stand-alone electro-mechanical instruments and a variety of different and independent dedicated inputs. Advances in high speed vector graphic display systems based on modular LED flat panel technology and micro-programmable multiprocessor data handling with MIL-STD-1553B compatible interfaces are described. Applications and systems performance are discussed in terms of typical military airborne mission-oriented display image formats and associated hardware and software characteristics. The real-time vector graphic presentations as described include flight control, navigation, communications, engine and fuel management, weapons management, symbolic map, signal communication and other types of real-time cockpit advisory information. T.M.

N82-18170# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).

A REDUNDANCY CONCEPT FOR A DIGITAL CSAS **c05**

P. Wuest and M. Keller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 12 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

One of the promises of digital technology is the possibility of implementing more intelligent monitoring techniques, for example, self monitoring methods. Typical redundancy and monitoring concepts, which were realized in aircraft, helicopter and engine control systems were reviewed. A system which was orginally not designed for a helicopter application but which shows all characteristics of a CSAS is described. The system is based on two essentially autonomous computing lanes, each able to provide all the necessary control and monitoring functions. T.M.

N82-18171# Newmark (Louis) Ltd., Croydon (England).

THE INFLUENCE OF SENSOR AND ACTUATOR CHARACTERISTICS ON OVERALL HELICOPTER AFCS DESIGN **c05**

S. G. Spreadborough *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The overall performance of a flight control system is dependent on the characteristics of: sensors-type and performance; control low computing and logic; actuation-performance, configuration redundancy and authority. The specifications in each of these areas are considered in producing an integrated AFCS design which is compatible with the basic aircraft characteristics. The choice of sensors and the configuration and performance of the actuation, important decisions involving a high level of interdependence with the control law and system logic design, are discussed. T.M.

N82-18172# Institut fuer Flugmechanik, Brunswick (West Germany).

EVALUATION OF THE HELICOPTER LOW AIRSPEED SYSTEM LASSIE **c06**

J. Kaletka *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

To evaluate the airspeed sensing capability and the dynamic response characteristics of the system, both flight tests and wind tunnel tests were conducted. The system uses a swivelling pitot static probe designed to operate within rotor downwash in the low airspeed regime and out of downwash for higher speeds. Due to nonlinearities in the sensor transition phase an accurate system characterization is necessary to obtain reliable airspeed data. Flight tests that were conducted to characterize the system for a Bo 105 helicopter are described. The evaluation method and results, showing uncalibrated and calibrated data are discussed in detail. To investigate the dynamic behaviour of the system, dynamic tests in a wind tunnel equipped with a gust generating system were conducted. LASSIE transfer functions were measured for four different wind tunnel speeds. Representative results are shown and discussed. T.M.

N82-18173# Elektronik-System G.m.b.H., Munich (West Germany).

INTEGRATION OF INERTIAL SENSORS IN HELICOPTERS **c06**

Volkmar Held *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

The demand for saving weight, volume and especially cost requires new design concepts for avionic systems. In future, highly integrated systems will replace the conventional systems with specific stand-alone equipment for each system function. A concept for the integration of inertial function flight control, sight-stabilization, navigation of a helicopter is presented. A configuration with a minimum number of dislocated inertial sensors is proposed. The system functions are accomplished on system level by integration and multiple use of the sensor signals. It is shown that the navigation functions, attitude and heading can be derived from the flight control and stabilization hardware so that the usually required separate attitude and heading reference system for the navigation is saved. Moreover, the proposed concept provides as an additional function the autonomous initial alignment to north. T.M.

N82-18174# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).

[AVIATION AND SPACE FLIGHT RESEARCH ACTIVITIES] Annual Report, 1980 [JAHRESBEREICHT 1980]

Sep. 1981 176 p refs In GERMAN
Avail: NTIS HC A09/MF A01

Results on the main research projects conducted in 1980 are described in the areas of transport and communication systems, airplanes, space flight techniques, exploration techniques, and energy and turbomachinery techniques. The improvement of reliability and security in transportation is a common feature of all projects. Aviation research is focussed on projects such as AIRBUS, fighter aircraft, and helicopters. Spacelab and the development of suitable payloads are the central issues of the space research effort with emphasis on material and processing techniques as well as biophysics and biomedicine. Data acquisition, using sensors and processing of satellite and Spacelab data is actively pursued. Recent developments in the domain of turbomachinery, nonnuclear energy research, energy conservation, and high energy laser techniques are also discussed.
Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*.

N82-18175 Ohio State Univ., Columbus.
RIME ICE ACCRETION AND ITS EFFECT ON AIRFOIL PERFORMANCE Ph.D. Thesis
Michael Bradford Bragg 1981 194 p
Avail: Univ. Microfilms Order No. 8128967

A methodology was developed to predict the growth of rime ice, and the resulting aerodynamic penalty on unprotected subcritical, airfoil surfaces. The system of equations governing the trajectory of a water droplet in the airfoil flowfield was developed and a numerical solution was obtained to predict the mass flux of super cooled water droplets impinging on the airfoil leading edge. By assuming that the droplets freeze on impact, a rime ice shape is predicted. The effect of time on the ice growth is modeled by a time stepping procedure where the flowfield and droplet mass flux are updated periodically through the ice accretion process. A similarity analysis was performed for the rime icing problem. Two new similarity parameters, are found to govern the accretion of rime ice. In addition an analytical solution is presented for Langmuir's classical modified inertia parameter. Dissert. Abstr.

N82-18176 California Univ., Berkeley.
INVESTIGATION OF SUPERSONIC SEPARATED FLOW IN A COMPARISON CORNER BY LASER DOPPLER ANEMOMETRY Ph.D. Thesis
Edmund Craig Baroth 1981 131 p
Avail: Univ. Microfilms Order No. 8200017

A single-component, computer-operated, three dimensional traversing laser doppler velocimetry (L.D.V.) system was designed and constructed for use in a supersonic wind tunnel. The model used was a 10 deg compression corner (Aspect Ratio = 1.34) which spanned the test section and was sealed at the side windows. The model provided an example of two dimensional laminar boundary layer separation. Mean streamwise velocity and turbulence intensity profiles were obtained for the region extending from upstream of separation to downstream of reattachment. The trend of decreasing upstream influence with increasing Reynolds number was confirmed. The two dimensional nature of the flow was confirmed by spanwise pressure taps. The laser system gave excellent results within the recirculation zone. The flow was found to be of the laminar type until downstream of reattachment. Individual mean velocity and turbulence intensity profiles, as well as velocity histograms are presented.
Dissert. Abstr.

N82-18177 Royal Aircraft Establishment, Farnborough (England).
MEASUREMENTS IN THE NEAR-WAKE OF A TRANSPORT MODEL, TO DETERMINE THE LIFT, DRAG AND DRAG COMPONENTS USING MASKELL'S ANALYSIS
A. J. Priest, D. G. Dobney, and R. P. Hill 3 Feb. 1981 91 p refs
(RAE-TR-81012; RAE-Aero-3497; BR79571) Copyright. Avail: Issuing Activity

A plane normal to the wake of a sweptwing/fuselage model of AIRBUS type, at C sub L = 0.49 in incompressible flow was measured, using a computer controlled wake traverse system incorporating a null reading five hole yawmeter probe. The results define the detailed distributions of total pressure defect, flow velocity, flow angles and streamwise vorticity in the viscous wake at that plane. The results allow the calculation of lift and drag from traverse data and the resolution of the drag into provisionally defined components CD1 and CD2, relating to the profile drag and vortex drag. Author (ESA)

N82-18178*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPARISON OF TWO PARALLEL/SERIES FLOW TURBOFAN PROPULSION CONCEPTS FOR SUPERSONIC V/STOL
R. W. Luidens, G. E. Turney, and J. Allen 1981 15 p refs Presented at the V/STOL Conf., Palo Alto, Conf., 7-9 Dec. 1981
(NASA-TM-82743; AIAA-81-2637; E-1056) Avail: NTIS HC A02/MF A01 CSCL 01A

The thrust, specific fuel consumption, and relative merits of the tandem fan and the dual reverse flow front fan propulsion systems for a supersonic V/STOL aircraft are discussed. Consideration is given to: fan pressure ratio, fan air burning, and variable core supercharging. The special propulsion system components required are described, namely: the deflecting front inlet/nozzle, the aft subsonic inlet, the reverse pitch fan, the variable core supercharger and the low pressure forward burner. The potential benefits for these unconventional systems are indicated. Author

N82-18179*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ANALYTICAL INVESTIGATION OF THE FREE-TIP ROTOR FOR HELICOPTERS
Robert H. Stroub Feb. 1982 30 p refs
(NASA-TM-81345; A-8806) Avail: NTIS HC A03/MF A01 CSCL 01A

A rotor configuration called the free-tip rotor was analytically investigated for its potential to improve helicopter forward-flight performance characteristics. This rotor differs from a conventional rotor only in the blade tip region. In this configuration, the tip is self-adjusting in pitch with respect to the rest of the blade, in accordance with a moment balance about its pitch axis. With this self-adjusting capability, the resulting pitch motion generates a more uniform airload distribution around the azimuth. Computer math models were used to compare performance characteristics of the free tip rotor with those of a conventional rotor operation at flight speeds from 130 to 160 knots. The results of this analysis indicate that the free-tip rotor improves cruise lift-drag ratio by at least 22%. Author

N82-18180*# United Technologies Research Center, East Hartford, Conn.
AN EXPERIMENTAL INVESTIGATION OF GAPWISE PERIODICITY AND UNSTEADY AERODYNAMIC RESPONSE IN AN OSCILLATING CASCADE. VOLUME 2: DATA REPORT. PART 1: TEXT AND MODE 1 DATA Final Report
Franklin O. Carta Dec. 1981 411 p refs
(Contract NAS3-22018)
(NASA-CR-165457-Vol-2-Pt-1; R81-914618-28-Vol-2-Pt-1)
Avail: NTIS HC A16/MF A01 CSCL 01A

Tests were conducted a linear cascade of airfoils oscillating in pitch to measure the unsteady pressure response on selected blade along the leading edge plane of the cascade, over the chord of the center blade, and on the sidewall in the plane of the leading edge. The tests were conducted for all 96 combinations 2 mean camberline incidence angles 2 pitching amplitudes 3 reduced frequencies and 8 interblade phase angles. The pressure data were reduced to Fourier coefficient form for direct comparison, and were also processed to yield integrated loads and particularly, the aerodynamic damping coefficient. Data obtained during the test program, reproduced from the printout of the data reduction program are complied. A further description of the contents of this report is found in the text that follows. Author

N82-18181*# United Technologies Research Center, East Hartford, Conn.
AN EXPERIMENTAL INVESTIGATION OF GAPWISE PERIODICITY AND UNSTEADY AERODYNAMIC RESPONSE IN AN OSCILLATING CASCADE. VOLUME 2: DATA REPORT. PART 2: MODE 2 DATA Final Report
Franklin O. Carta Dec. 1981 390 p refs
(Contract NAS2-22018)
(NASA-CR-165457-Vol-2-Pt-2) Avail: NTIS HC A17/MF A01 CSCL 01A

Computer data are provided for tests conducted on a linear cascade of airfoils oscillating in pitch to measure the unsteady pressure response on selected blades along the leading edge plane of the cascade, over the chord of the center blade, and on the sidewall in the plane of the leading edge. N.W.

N82-18182# Technische Hogeschool, Delft (Netherlands).
A METHOD OF CHARACTERISTIC SURFACES. THE APPROXIMATE SOLUTION OF THREE-DIMENSIONAL SUPERSONIC FLOW FIELDS FROM THE NEAR FIELD UP TO THE SONIC BOOM REGION Ph.D. Thesis
Theodorus Petrus Marie Hendriks 12 Nov. 1981 163 p refs Avail: NTIS HC A08/MF A01

A method of characteristic surfaces is presented, which may be used to describe the supersonic flow past a three dimensional body uniformly valid up to first order. The method is based on a geometric study of the characteristic surfaces, which envelop the most important disturbances in the originally undisturbed free stream. This leads to the conclusion that the linearized theory can be made valid throughout a supersonic flow field, provided that the predicted flow perturbations are shifted from acoustical characteristic surfaces towards corresponding first order surfaces. Author

N82-18183*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPIN-TUNNEL INVESTIGATION OF A 1/13-SCALE MODEL OF THE NASA AD-1 OBLIQUE-WING RESEARCH AIRCRAFT
William L. White and James S. Bowman, Jr. Feb. 1982 28 p ref
(NASA-TM-83236; L-14834) Avail: NTIS HC A03/MF A01 CSCL 01A

The spin and recovery characteristics of a 1/13-scale model of the NASA AD-1 oblique-wing research aircraft at wing-skew positions of 0, 25, 45, and 60 deg (right wing forward) were investigated. Spins were obtained for all wing-skew positions tested. For the unskewed wing position, two spin modes were possible. One spin mode was very steep and recoveries were obtained within 1 turn or less by rudder reversal. The second spin mode was flat and fast; the angle of attack was about 75 deg and the spin rate was about 145 deg/sec (2.5 seconds per turn). For the skewed wing positions, spins were obtained only in the direction of the forward-skewed wing (right wing forward). No spins were obtained to the left when the wing was skewed with the right wing forward. Recoveries should be attempted by deflecting the rudder to full against the spin, the ailerons to full with the spin, and movement of the wings to 0 deg skew. If the wing is skewed, the recovery may not be effected until the wing skew approaches 0 deg. B.W.

N82-18184*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
NUMERICAL ANALYSIS AND FORTRAN PROGRAM FOR THE COMPUTATION OF THE TURBULENT WAKES OF TURBOMACHINERY ROTOR BLADES, ISOLATED AIRFOILS AND CASCADE OF AIRFOILS Final Report - Ph.D. Thesis Mar. 1980
C. Hah and B. Lakshminarayana Washington NASA Feb. 1982 171 p refs
(Grant NsG-3012)
(NASA-CR-3509; PSU-TURBO-81-4) Avail: NTIS HC A08/MF A01 CSCL 01A

Turbulent wakes of turbomachinery rotor blades, isolated airfoils, and a cascade of airfoils were investigated both numerically and experimentally. Low subsonic and incompressible wake flows were examined. A finite difference procedure was employed in the numerical analysis utilizing the continuity, momentum, and turbulence closure equations in the rotating, curvilinear, and nonorthogonal coordinate system. A nonorthogonal curvilinear coordinate system was developed to improve the accuracy and efficiency of the numerical calculation. Three turbulence models were employed to obtain closure of the governing equations. The first model was comprised to transport equations for the turbulent kinetic energy and the rate of energy dissipation, and the second and third models were comprised of equations for the rate of turbulent kinetic energy dissipation and Reynolds stresses, respectively. The second model handles the convection and diffusion terms in the Reynolds stress transport equation collectively, while the third model handles them individually. The numerical results demonstrate that the second and third models provide accurate predictions, but the computer time and memory storage can be considerably saved with the second model. B.W.

N82-18185# Lockheed-Georgia Co., Marietta.
CAVITY OSCILLATION IN CRUISE MISSILE CARRIER AIRCRAFT Final Report, Aug. 1979 - Apr. 1981
Harold W. Bartel and James M. McAvoy Wright-Patterson AFB, Ohio AFWAL Jun. 1981 151 p refs
(Contract F33615-79-C-3207; AF Proj. 2401)
(AD-A108610; LG81ER0156; AFWAL-TR-81-3036) Avail: NTIS HC A08/MF A01 CSCL 20/4

This report discusses cavity oscillation in general, and particularly the problem of cavity oscillation in the missile bays of cruise missile carrier aircraft during missile launch. The missile bay configurations analyzed ranged from the complete interior volume of a large transport aircraft, to the bomb bay of a conventional bomber. All of the carrier aircraft cases evaluated were conceptual; no specific airframe models or manufacturers are identified. The principles and technology presented are not limited to missile bays; they are applicable to general cavities having free-stream flow velocities above Mach 0.4. It is observed that above Mach 0.4 the pressure fluctuations in an oscillating cavity may arise from: (a) sustained periodic pressure fluctuations in the aperture shear layer that radiate noise into the cavity; and (b) sustained periodic pressure fluctuations in the aperture shear layer that couple with the cavity volume acoustic modes (this generally produces by far the most intense cavity oscillation). Theoretical/empirical techniques are presented for predicting oscillatory frequency, pressure level, pressure spatial distribution in the cavity, and the degree of alleviation achievable with suppressors. The information is based on extensive experimentation with subscale models having apertures of 2 to 6 in. in a cold air wall-jet flow facility. A bibliography is included containing 145 listings. Author (GRA)

N82-18186# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
THE FORMATION OF A RING VORTEX AT A CIRCULAR JET NOZZLE AND ITS TRANSFORMATION DURING TAKEOFF INTO A LIQUID LAYER AND AT THE LIQUID SURFACE [DIE BILDUNG EINES RINGWIRBELS AN EINER KREISFOERMIGEN DUE SENMUENDUNG UND SEINE UMBILDUNG BEIM AUFSTIEG IN EINER FLUESSIGKEITSSCHICHT UND AN DER FLUESSIGKEITSOBERFLAECHE]
Thomas Krauch Dec. 1980 53 p refs In GERMAN
(MPIS-27/1980; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,65

Simulated formation and transformation of a rotating vortex was performed. Boundary layer vortex transformation is reviewed. The transformation of a vortex ring on a water surface is also studied. Transl. by E.A.K.

N82-18187# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
ON THE CALCULATION OF TRANSONIC BLADE TIP FLOW FOR HELICOPTER ROTORS [ZUR BERECHNUNG DER TRANSSONISCHEN BLATTSPITZENUMSTROEMUNG BEI HUBSCHRAUBERROTOREN]
H. Stahl and V. Mikulla 8 May 1981 27 p refs In GERMAN Presented at DGLR Jahrestagung 1981, Aachen, 12-14 May 1981
(MBB-UD-320-81-O; DGLR-81-025) Avail: NTIS HC A03/MF A01

Blade element theory (two dimensional) based on the rotor calculation program, its radials and its chronological relationship was demonstrated. Blade tip flow is three dimensional and interstationary and the forward moving blade in a fast forward flight becomes transonic. Theories, based on potential theory are proposed, though these do not perform on rotary wings. This method demonstrates the real flow rate. A three dimensional calculation of the aerodynamic characteristics of the fixed wings, was utilized, to show that by introducing a Mach number per gradient along the rotor radius, rotor calculation can be modified. Transl. by E.A.K.

N82-18188# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
ON THE CALCULATION OF SEPARATED FLOW ON HELICOPTER FUSELAGES [ZUR BERECHUNG DER ABGELOESTEN STROENUNG AN HUBSCHRAUBERRUEMPFEN]
G. Polz 11 May 1981 28 p refs In GERMAN Presented at DGLR Jahrestagung 1981, Aachen, 12-14 May 1981
(MBB-UD-321-81-O; DGLR-81-026) Avail: NTIS HC A03/MF A01

Separated flows in helicopters with dead water formation on the fuselage tail were examined. A model was developed which is based on a combination of panel and interface calculation method, which is simulated in the dead water area by a similar circulation coated track alignment body. The point of gravity lies more on the fuselage, which is especially significant for helicopter, because of its effect on tail rotor and tail plane. Results from wind tunnel tests and flight tests are presented.
Transl. by E.A.K.

N82-18189# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
INVESTIGATIONS OF THE SEPARATION BEHAVIOR ON AIRFOILS AT HIGH ANGLES OF ATTACK, USING LINEAR LIFT THEORY Thesis - Hochschule der Bundeswehr, Munich [UNTERSUCHUNGEN ZUM ABREISSVERHALTEN VON TRAGFLUEGELN IM HOHEN ANSTELLWINKELBEREICH MIT HILFE DER TRAGLINIENTHEORIE]
Karl-Heinz Haerdtl 1 Nov. 1980 157 p refs In GERMAN
(MBB-FE-122/S/PUB/37; Rept-80/7) Avail: NTIS HC A08/MF A01

Different methods for calculating the lift coefficient of an airfoil wing were examined. The calculation of aerodynamic characteristics of airplanes is of great importance. Complex three dimensional boundary layers, especially for swept back wings with leading edge slats and trailing edges with split flaps which very much effect airfoil flows. Two different methods to calculate three dimensional boundary layers are presented.
Transl. by E.A.K.

N82-18190# European Space Agency, Paris (France).
LAMINAR AIRFOILS FOR TRANSPORT AIRCRAFT
Armin Quast Oct. 1981 33 p refs Transl. into ENGLISH of "Laminarprofile fuer verkehrsflugzeuge" Rept. DFVLR-Mitt-80-07 DFVLR, Brunswick, Mar. 1980 33 p
(ESA-TT-680; DFVLR-Mitt-80-07) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8,30

The development of laminar airfoils in order to save fuel by reducing drag is discussed. Laminarization through shaping is considered. Laminar and turbulent boundary layer theory and subjective assessment indicate that laminar airfoils for high Reynolds numbers are feasible, with a 22% fuel saving. The reduced cruising speeds, required, however, decrease passenger comfort, making them more suitable for freight carrying.
Author (ESA)

N82-18191# European Space Agency, Paris (France).
THEORETICAL PREDICTION OF BASE PRESSURE ON MISSILE BODIES HAVING A TURBULENT DEAD-AIR REGION AT SUPERSONIC VELOCITIES
Mauri Tanner Nov. 1981 71 p refs Transl. into ENGLISH of "Theoretische Bestimmung des Basisdruckes von Flugkoerperruempfen mit turbulentem Totwasser bei Ueberschallgeschwindigkeiten" Rept. DFVLR-FB-80-29 DFVLR, Goettingen, West Germany, Sep. 1980 79 p
(ESA-TT-708; DFVLR-FB-80-29) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 13,60

A theory which predicts the base pressure and afterbody drag on axisymmetric missile bodies at supersonic velocities is presented. The body is assumed to have a turbulent dead air region behind the base. This theory extends the theory of Oswatitsch which connects the drag of the body with the antropy increase in the flow. Values for missile bodies at angles of incidence < or = 20 deg are approximated. Various calculation examples are shown and a comparison with experimental values shows good agreement between theory and measurement.
Author (ESA)

N82-18120# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
DEVELOPMENTS IN ROTARY WING AIRCRAFT AERODYNAMICS
I. C. Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 27 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18121# Massachusetts Inst. of Tech., Cambridge.
A SIMPLIFIED APPROACH TO THE FREE WAKE ANALYSIS OF A HOVERING ROTOR
R. H. Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18122# Politecnico di Milano (Italy). Instituto di Ingegneria Aerospaziale.
AN EXPERIMENTAL ANALYSIS OF THE SHAPE OF A ROTOR WAKE
Sergio DePonte and Luigi Vigevano *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 8 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18123# Tokyo Univ. (Japan).
AN EXTENSION OF THE LOCAL MOMENTUM THEORY TO THE ROTORS OPERATING IN TWISTED FLOW FIELD
Akira Azuma, Ken-ichi Nasu, and Takatoshi Hayashi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18124# Nanjing Aeronautical Inst. (China).
A SIMPLIFIED METHOD FOR PREDICTING ROTOR BLADE AIRLOADS
Wang Shi-cun and Xu Zhi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 28 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18125# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
A THREE-DIMENSIONAL APPROACH TO LIFT AND MOMENT COEFFICIENTS OF ROTATING BLADES
Wolfgang Send *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18128# Hochschule der Bundeswehr, Munich. (West Germany). Inst. fuer Luftfahrttechnik und Leichtbau.
DYNAMIC AND AEROELASTIC CHARACTERISTICS OF COMPLETE WINDTURBINE SYSTEMS
E. W. Steinhardt *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18147*# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
PREDICTION OF BLADE VORTEX INTERACTION NOISE FROM MEASURED BLADE PRESSURE
Yoshiya Nakamura *In* DGLR Seventh European Rotorcraft and

Powered Lift Aircraft Forum 1981 20 p refs Sponsored by NASA (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01 CSCL 01A

N82-18152# Hindustan Aeronautics Ltd., Bangalore (India). Helicopter Design Bureau.
AUTOMATIC GENERATION OF EQUATIONS FOR ROTOR-BODY SYSTEMS WITH DYNAMIC INFLOW FOR A PRIORI ORDERING SCHEMES
J. Nagabhushanam, G. H. Gaonkar (Indian Inst. of Science), and T. S. R. Reddy (Indian Inst. of Science) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 37 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18157# Tokyo Univ. (Japan). Inst. of Interdisciplinary Research.
A NUMERICAL APPROACH TO CO-AXIAL ROTOR AERODYNAMICS
Shigeru Saito and Akira Azuma *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18158# Institut fuer Flugmechanik, Brunswick (West Germany).
HELICOPTER ROTOR DOWNWASH: RESULTS OF EXPERIMENTAL RESEARCH AT THE DFVLR-ROTOR TEST STAND AND THEIR COMPARISON WITH THEORETICAL RESULTS
B. Junker and H.-J. Langer *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18160# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE PROBLEM OF CALCULATION OF THE FLOW AROUND HELICOPTER ROTOR BLADE TIPS
H. Stahl *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18162# Royal Aircraft Establishment, Farnborough (England).
SOME UNSTEADY AERODYNAMIC EFFECTS ON HELICOPTER ROTORS
P. G. Wilby, M. J. Riley, and Judith Miller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18163# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
SEPARATED FLOW AROUND HELICOPTER BODIES
G. Polz and J. Quentin *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18164# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
A METHOD OF PREDICTING FUSELAGE LOADS IN HOVER
P. Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N82-18192# Rockwell International Corp., El Segundo, Calif.
MULTIPLE EJECTION EFFECTS ANALYSIS Final Report, 8 May - 30 Dec. 1980
G. A. Freeman and G. R. Casteel Wright-Patterson AFB, Ohio Air Force Medical Research Labs. Aug. 1981 92 p refs
(Contract F33615-80-C-0519; AF Proj. 7231)
(AD-A108277; NA-80-545; AFAMRL-TR-80-140) Avail: NTIS HC A05/MF A01 CSCL 05/5

Wind tunnel data for the ACES-B1 ejection seat in the presence of the B-1 forebody are documented and analyzed. Significant aerodynamic interactions exist at high speed between dual seats and between seat/forebody. Trajectory data are presented with and without the forebody effect upon the seat. The forebody flow field is shown to increase the human engineering/biomechanical problems during high-speed ejection. Author (GRA)

N82-18193# Douglas Aircraft Co., Inc., Long Beach, Calif.
AIRCREW RESTRAINT AND MOBILITY TEST FIXTURE Final Report
A. Blair McDonald Wright-Patterson AFB, Ohio AMRL Jul. 1981 33 p refs
(Contract F33615-79-C-0522; AF Proj. 7231)
(AD-A108274; AFAMRL-TR-81-27) Avail: NTIS HC A03/MF A01 CSCL 14/2

The next generation combat aircraft with advanced aerodynamic and control features will have combat maneuver capability which will impose multiaxial accelerations on the aircrew. Advanced aircrew systems will be required for restraint, support, and mobility during these combat conditions. New concepts for these systems have been defined, but tests under representative dynamic conditions are necessary to evaluate the effectiveness of these concepts when implemented. Author (GRA)

N82-18194# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
PHYSIOLOGICAL ACCEPTABILITY TESTS OF THE SJU-5/A EJECTION SEAT: SECOND PHYSIOLOGICAL ACCEPTANCE DEMONSTRATION Final Report
William C. Ward, Jr. and Kenneth L. Miller 1 Jul. 1981 23 p refs
(AD-A108688; NADC-81215-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

This program was conducted to evaluate solutions to deficiencies of the F18 Aircraft Martin-Baker SJU-5/A escape system which had been identified during the initial Physiological Acceptability Demonstration (Report No. NADC-79040-60). The proposed solutions evaluated during this program included: incorporation of 'toe guides' on the rudder pedals, relocation of the head rest, modification of the back support, and incorporation of leg garters into the anti-'G' suit. Of these, the head rest and back support still require additional modification. Upon satisfactory correction of the head rest and back support deficiencies, physiological acceptance of the F18 escape system will be recommended for the pilot's station. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N82-18195# RAND Corp., Santa Monica, Calif.
DISTRIBUTED INTELLIGENCE FOR AIR FLEET CONTROL

Interim Report
Randall Steeb, Stephanie Cammarata, Frederick A. Hayes-Roth, Perry W. Thorndyke, and Robert E. Wesson Jun. 1981 59 p refs
(Contract MDA903-78-C-0029; ARPA Order 3640)
(AD-A108611; RAND/R-2728-ARPA; LC-81-13913; ISBN-0-8330-0353-4) Avail: NTIS HC A04/MF A01 CSCL 17/7

Distributed planning and control techniques provide potential advantages over centralized processing in speed, cost, reliability, flexibility, and minimization of long-distance communications for a variety of tasks, including military threat assessment, command and control decisionmaking, disaster relief coordination, and civilian air traffic control. Six different architectures for distribution of control among multiple processors are presented, and the influences of different task environments on each are discussed. The work focuses primarily on the use of distributed planning and control for civilian air traffic control. One architecture, in which each aircraft is controlled by a separate processor, is described in detail in an illustrative scenario. An initial system design is presented in which cooperating 'experts' comprise a processor. These cooperating experts sense or infer aircraft intentions, generate and evaluate plans, control and monitor plan execution, and communicate with other processors.
Author (GRA)

N82-18196# Army Missile Command, Redstone Arsenal, Ala. Guidance and Control Directorate.
SOFTWARE FEATURES APPLICABLE TO INERTIAL MEASUREMENT UNIT SELF ALIGNMENT
H. V. White, J. C. Hung, and W. G. Cantrell Dec. 1980 36 p refs
(AD-A108511; AD-E950182; DRSMI/RG-81-11-TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report documents two software features applicable to inertial measurement unit self-alignment. Features are the continuous-time algorithm and the 'scraping' technique. FORTRAN programs for least-square with and without scraping are included. Author (GRA)

N82-18197# Nebraska Univ., Lincoln. Dept. of Electrical Engineering.
IMPROVEMENTS AND EXTENSIONS OF THE GEOMETRICAL DILUTION OF PRECISION (GDOP) CONCEPT FOR SELECTING NAVIGATION MEASUREMENTS Final Report, 1 May 1980 - 1 May 1981
William L. Brogan Wright-Patterson AFB, Ohio AFWAL Sep. 1981 69 p refs
(Contract F33615-80-C-1092; AF Proj. 6095)
(AD-A108607; AFWAL-TR-81-1142) Avail: NTIS HC A04/MF A01 CSCL 17/7

The optimal measurement selection problem was studied for the Global Positioning Satellite system (GPS). The fundamentals of the Geometrical Dilution of Precision (GDOP) concept were briefly reviewed, because GDOP is frequently used to rank the effectiveness of potential measurements. It is shown that GDOP does not always select the best measurements in the sense of minimum mean square navigation error. For this reason weighted least-squares and minimum variance (Kalman filter) methods were used to derive several improved measurement ranking schemes. Nonuniform measurement noise and a prior knowledge about the state are taken into account. Any specified weighted combination of the component error variances can be minimized. Eigenvalue-eigenvector theory was used to derive useful bounds and to provide geometrical insight. A purely algorithmic approach is also presented and applied to a number of representative GPS cases. GRA

N82-18198# European Space Agency, Paris (France).
A POSSIBLE WAY OF SPECIFICALLY CORRECTING LOCATION AND NAVIGATIONAL ERRORS CAUSED BY REFLECTION AND OTHER PROPAGATION ANOMALIES
Fritz Stelzel Jul. 1981 125 p refs Transl. into ENGLISH of "Uber eine Moeglichkeit zur gezielten Korrektur von Ortungs- u. Navigationsfehlern, die durch Reflexionen u. sonstige Ausbreitungsanomalien verursacht werden", Rept. DFVLR-Mitt-79-17 DFVLR, Oberpfaffenhofen, West Germany, May 1979
(ESA-TT-667; DFVLR-Mitt-79-17) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,20

Electromagnetic wave propagation in urban areas is discussed in relation to vehicle location. Current methods are reviewed for vehicles on a arbitrary route. Isophase and hyperbola systems are compared. The isophase system is more accurate. A correction procedure for multipath induced errors is presented, based on measuring time signals from four transmitters. The use of measured times in order to reduce location errors caused by propagation anomalies is described. The methods were tested on a simulated city area covered by transmitters on the corners of a 25 km square. Results are inconclusive. Author (ESA)

N82-18199# European Space Agency, Paris (France).
EXTENSION OF PROPORTIONAL NAVIGATION BY THE USE OF OPTIMAL FILTERING AND CONTROL METHODS
Hans-Dieter Joos Aug. 1981 31 p refs Transl. into ENGLISH of "Erweiterung der Proportionalnavigation durch Anwendung optimaler Filterungs- und Regelungsmethoden", Rept. DFVLR-FB-80-10 DFVLR, Oberpfaffenhofen, West Germany, Mar. 1980 38 p
(ESA-TT-683; DFVLR-FB-80-10) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 8,30

A suboptimal guidance law for homing missiles, based on quadratic optimal stochastic control theory is investigated. On-line backward integration from final time to actual time is not required. A Kalman-Bucy filter which takes nonlinearity and target maneuvers into account is presented. The model is compared to the conventional and extended proportional navigation systems (simulated on a nonlinear quidance loop model). Positional error behavior improves by 45%. Author (ESA)

N82-18200# European Space Agency, Paris (France).
MIDAIR AND NEAR MIDAIR COLLISIONS ON TWO- AND THREE-DIMENSIONAL CURVILINEAR FLIGHT PATHS
Otto Weber Aug. 1981 119 p refs Transl. into ENGLISH of "Zusammenstoesse und gefaehrliche Begegnungen bei zwei- und dreidimensionalen Kurvenfluegen", Rept. DFVLR-FB-80-13 DFVLR, Brunswick, Mar. 1980 107 p
(ESA-TT-685; DFVLR-FB-80-13) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21

Collision avoidance by the see and avoid concept, advanced secondary radar systems on the ground, and independent electronic systems onboard are discussed. For two and three dimensional stationary turns, basic geometrical and physical aspects of conflict detection are derived and details are given on the apparent size and motion of the other aircraft on the windshield. For conflict warning by means of ground based or onboard electronic systems, a linear track model is used. The predicted minimum distance at the closest approach, the lead times to this event or to the penetration of a zone of protection around the intruder, and the zeta parameter are analyzed as potential conflict criteria. Similarity rules and the separation of three dimensional conflicts into horizontal and vertical problems are treated. Commercial pilots lack special training in optically based risk assessment. Autonomous onboard warning systems do not make the see and avoid concept obsolete. Author (ESA)

N82-18201# National Ocean Survey, Rockville, Md.
UNITED STATES COAST PILOT 9. PACIFIC AND ARCTIC COASTS ALASKA: CAPE SPENCER TO BEAUFORT SEA
Jan. 1981 425 p Revised
(PB82-109562; NOAA-81021105) Avail: NTIS HC A18/MF A01 CSCL 17G

Coast Pilot subjects include navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes, pilotage, and port facilities. Information is included on navigation regulations, Cape Spencer to Beaufort Sea, Cape Spencer to Cook Inlet, Kodak Island, Alaska Peninsula, Aleutian Islands, Bering Sea and Arctic Ocean. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-18202*# McDonnell-Douglas Corp., Long Beach, Calif.
A STUDY TO DEFINE THE RESEARCH AND TECHNOLOGY REQUIREMENTS FOR ADVANCED TURBO/PROPFAN TRANSPORT AIRCRAFT Final Report
Irene M. Goldsmith Feb. 1981 313 p refs
(Contract NAS2-10078)
(NASA-CR-166138; ACEE-16-FR-0016) Avail: NTIS HC A14/MF A01 CSCL 01C

The feasibility of the propfan relative to the turbofan is summarized, using the Douglas DC-9 Super 80 (DS-8000) as the actual operational base aircraft. The 155 passenger economy class aircraft (31,775 lb [14,413 kg] payload), cruise Mach at 0.80 at 31,000 ft (8,450 m) initial altitude, and an operational capability in 1985 was considered. Three propfan arrangements, wing mounted, conventional horizontal tail aft mounted, and aft fuselage pylon mounted are selected for comparison with the DC-9 Super 80 P&WA JT8D-209 turbofan powered aircraft. The configuration feasibility, aerodynamics, propulsion, structural loads, structural dynamics, sonic fatigue, acoustics, weight maintainability, performance, rough order of magnitude economics, and airline coordination are examined. The effects of alternate cruise Mach number, mission stage lengths, and propfan design characteristics are considered. Recommendations for further study, ground testing, and flight testing are included. Author

N82-18203*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SLOTTED VARIABLE CAMBER FLAP Patent Application
Dana G. Andrews, inventor (to NASA) (Boeing Commercial Airplane Co., Seattle) Filed 30 Oct. 1981 13 p Sponsored by NASA
(NASA-Case-LAR-12541-1; US-Patent-Appl-SN-315588) Avail: NTIS HC A02/MF A01 CSCL 01C

Variable camber actuator assemblies broaden the range of speeds at which lift to drag performance is maximized for slotted flap wings. Lift is improved by varying wing camber with rotational flap movements that do not introduce wing slots and induced drag. Forward flaps are secured to forward flange links which extend from, and are a part of, forward flap linkage assemblies. The forward flaps rotate about flap pivots with their rotational displacement controlled by variable camber actuator assemblies located between the forward flaps and the forward flange links. Rear flaps are held relative to the forward flaps by rear flap linkage assemblies which may act independently from the forward flap linkage assemblies and the variable camber actuator assemblies. Wing camber is varied by rotating the flaps with the variable camber actuator assemblies while the flaps are in a deployed or tucked position. Rotating flaps in a tucked position does not introduce significant wing surface discontinuities, and reduces aircraft fuel consumption on most flight profiles. NASA

N82-18204*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DYNAMICS OF AIRCRAFT ANTISKID BRAKING SYSTEMS
John A. Tanner, Sandy M. Stubbs, Robert C. Dreher, and Eunice G. Smith Feb. 1982 100 p refs
(NASA-TP-1959; L-14788) Avail: NTIS HC A05/MF A01 CSCL 01C

A computer study was performed to assess the accuracy of three brake pressure-torque mathematical models. The investigation utilized one main gear wheel, brake, and tire assembly of a McDonnell Douglas DC-9 series 10 airplane. The investigation indicates that the performance of aircraft antiskid braking systems is strongly influenced by tire characteristics, dynamic response of the antiskid control valve, and pressure-torque response of the brake. The computer study employed an average torque error criterion to assess the accuracy of the models. The results indicate that a variable nonlinear spring with hysteresis memory function models the pressure-torque response of the brake more accurately than currently used models. T.M.

N82-18205# Committee on Armed Services (U. S. House).
REVIEW OF DEFENSE-RELATED VERTICAL AND SHORT TAKEOFF AND LANDING (V/STOL) AIRCRAFT PROGRAMS
Walter Z. Collings Washington GPO 1979 206 p refs Presented to the Comm. on Armed Serv., 96th Congr., 1st Sess., Sep. 1978 Prepared by AIAA, New York
(GPO-55-278) Avail: Committee on Armed Services

A technology review of bases supporting the development of Vertical of Short Takeoff and Landing (V/STOL) aircraft is presented. Representative aircraft were summarized according to their type of lift generation mechanisms. Successes, failures, problems encountered in development, and plans for the future are also presented. Some discussion of the Navy's envisionment/commitment to V/STOL aircraft is also presented. M.D.K.

N82-18206# Rockwell International Corp., Columbus, Ohio. Aircraft Div.
XFV-12A DIAGNOSTIC AND DEVELOPMENT PROGRAMS Summary Report, Jan. 1979 - May 1981
P. M. Bevilaqua and C. P. Combs Nov. 1981 367 p refs
(Contract N00019-73-C-0053)
(AD-A108354; NR81H-50) Avail: NTIS HC A16/MF A01 CSCL 01/3

Activity during the XFV-12A thrust augmenter development program conducted from May 1979 to June 1981 is reported and documented. Diagnostic tests indicated a major source of performance deficiency could be attributed to feed duct/augmenter component interface problems rather than basic augmenter configuration. Interface problems seriously affected both isolated performance and flow quality of the primary augmenter nozzles resulting in significantly low levels of augmentation. A remedial program, the subject of this report, was initiated. The primary objective of this program was to systematically improve the performance of the XFV-12A aircraft's thrust augmenter lift systems. Major emphasis was placed not only on correcting flow deficiencies but also identifying and incorporating improvements in the augmenter design which would increase its performance potential. GRA

N82-18207# General Accounting Office, Washington, D. C.
POTENTIAL REDUCTIONS IN AIRCRAFT OPERATION AND MAINTENANCE COSTS BY USING THRUST COMPUTING SUPPORT EQUIPMENT Report to the Honorable Joseph P. Addabbo, Chairman, Subcommittee on Defense, Committee on Appropriations, House of Representatives
27 Oct. 1981 17 p
(AD-A108463; GAO/PLRD-82-4) Avail: NTIS HC A02/MF A01 CSCL 01/2

This report addresses the evaluation of thrust measuring equipment. We interviewed Air Force officials and contractor representatives, reviewed documentation pertaining to the key events in the evaluation of the thrust computing system program, reviewed test data and analyses by Air Force and contractor engineers, and observed the operation of the thrust computing system. Our analyses show that the accurate measurement and setting of thrust for installed jet engines is of vital importance not only for aircraft readiness and safety but also for operation and maintenance cost reductions. Although test results indicate that a system is available that can perform such measurements, the services have not been using it. The Air Force has conducted extensive tests that will measure thrust for installed J85-5 engines, but has not implemented a system. The Navy has not performed any tests to determine whether its aircraft jet engines might benefit from such a system. GRA

N82-18208# Institute for Defense Analyses, Arlington, Va. Systems Evaluation Div.
C-5A AUSTERE AIRFIELD OPERATIONAL UTILITY EVALUATION. PHASE 2: OPERATION ON UNPAVED SOIL SURFACES FOLLOWING RAINFALL Final Report
Waldemar O. Breuhaus Oct. 1981 46 p refs
(Contract MDA903-79-C-0018)
(AD-A108597; AD-E500466; IDA-P-A1621; IDA/HQ-81-23896) Avail: NTIS HC A03/MF A01 CSCL 01/3

During the summer of 1980 and the winter of 1980-1981, an Operational Utility Evaluation (OUE) was conducted to determine operating characteristics of the C-5A airplane when taxiing or being towed and off-loaded on unpaved soil surfaces and on snow-covered surfaces. Subsequent to the successful completion of those tests, questions arose concerning the effects of rainfall that wets otherwise adequate bare soil areas to a significant depth. Tests with simulated rainfall of various amounts applied by agricultural sprinkler systems were conducted at March AFB, California, during July 1981. The airplane performed well, though it approached its performance limits in the most severe test conditions. Difficulties were encountered in arriving at a sprinkler system configuration reasonably approximating naturally occurring rainfall, and in arriving at a single simple descriptor to properly characterize the strength of soil in such a complex situation.
GRA

N82-18209# Army Aeromedical Research Lab., Fort Rucker, Ala. Biodynamics Research Div.
VIBRATION LEVELS IN ARMY HELICOPTERS: MEASUREMENT RECOMMENDATIONS AND DATA Final Report
John C. Johnson and David B. Priser Sep. 1981 35 p refs (DA Proj. 3E1-6277-A-878)
(AD-A108131; USAARL-81-5) Avail: NTIS HC A03/MF A01 CSCL 01/3

Surveys on vibration levels found in currently fielded helicopters were used to prepare a comparative summary of vibration exposure levels at crew stations and of the test methods used to measure these levels. This effort was initiated at the request of the Air Standardization Coordinating Committee (ASCC) Working Party 61 and because of the wide variety of methods used in data capture and instrumentation documentation. Sources of the literature reviewed included technical reports of U.S. Government agencies and papers in open literature. Articles were reviewed based upon three criteria: (1) quantitative description of vibration in currently fielded U.S. Army rotary winged aircraft, (2) article contents are unclassified and available for publication in open literature, (3) article describes human exposure levels of aircraft vibration. Author (GRA)

N82-18210# Aeronautical Systems Div., Wright-Patterson AFB, Ohio. Flight Technology Div.
A DIGITAL SIMULATION PROGRAM DESCRIBING THE MOTION OF AN AIRCRAFT UNDERGOING ENGINE FAILURE DURING ITS TAKEOFF GROUND ROLL Final Report, Jun. 1980 - Mar. 1981
Michael J. Miedlar Sep. 1981 77 p refs
(AD-A108420; ASD-TR-81-5030) Avail: NTIS HC A05/MF A01 CSCL 01/2

This report presents a non-interactive 'MIMIC' program developed to generate the time history of an aircraft undergoing an engine failure during its ground roll. The program calculates the forces and moments acting on the aircraft, and uses MIMIC's implicit integration routine to track its motion. The equations and assumptions used are presented and discussed. This report also lists the program and delineates its functions. Author (GRA)

N82-18211# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
THEORETICAL INVESTIGATIONS ON THE INFLUENCE OF DIFFERENT STRAKE, TAIL UNIT, AND CONVENTIONAL HLW ARRANGEMENT AS WELL AS OF CCV ON THE AERODYNAMIC CHARACTERISTICS OF FIGHTER AIRCRAFT CONFIGURATIONS Thesis - Hochschule der Bundeswehr, Munich [THEORETISCHE UNTERSUCHUNGEN UEBER DEN EINFLUSS VON VERSCHIEDENEN. STRAKE, ENTENLEITWERKS- UND KONVENTIONELLEN HOEHENLEITWERKSANORDNUNGEN SOWIE VON C.C.V. AUF DIE AERODYNAMISCHEN EIGENSCHAFTEN VON KAMPFFLUGZEUG-KONFIGURATIONEN]
Herbert Klimt, Dieter Oberst, and Walter Schmalhofer 1 Oct. 1980 486 p refs In GERMAN
(MBB-FE-122/S/PUB/36) Avail: NTIS HC A01/MF A01

Linear and nonlinear aerodynamic characteristics for fighter airplane configurations with three separate tail-wing-surface ratios as related to lift coefficients were optimized. The optimal configurations were reduced by 5% for stability and 10% for instability and their lifting responses are compared. Fuselage effect and convergence of aerodynamic factors are also studied.
Transl. by E.A.K.

N82-18212# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
INTERPRETATION AND CONSTRUCTION OF A DYNAMIC SIMILARITY MODEL OF THE A 310 WINGS [AUSLEGUNG UND BAU EINES DYNAMISCH AEHNLICHEN MODELLS DES A 310 FLUEGELS]
H. Hoenlinger 5 May 1981 34 p refs In GERMAN Presented at DGLR-Jahrestagung 1981, Aachen, 11-14 May 1981
(MBB-FE-17/S/PUB/42; DGLR-81-035) Avail: NTIS HC A03/MF A01

The design and construction of a model for directional oscillation flutter for the A-310 wing with supercritical profile is discussed. The rigidity distribution in the model is simulated by a simple metal box. The profile geometry and the mass distribution of the model is copied exactly by a foam structure coated with a fiberglass laminate. A finite element model is used to explain the complicated engine mount, which is supported by a profile beam. Data on rigidity and vibration measurements are included. Transl. by E.A.K.

N82-18213# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
CHARACTERIZATION OF THE AIRBUS HORIZONTAL STABILIZERS OF CFRP CONSTRUCTION AND STRUCTURAL ANALYSIS WITH THE FINITE ELEMENT METHOD [AUSLEGUNG DES AIRBUSSEITENLEITWERKS IN CFK-BAUWISE UND STRUKTURANALYSE MIT DER FINITE-ELEMENTE-METHODE]
Erhard Winkler May 1981 22 p Reprint from "Verarbeiten u. Anwenden kohlenstoffaserverstaerkter kunststoffe" Vereins Deut. Ingr., May 1981 p 181-198 In GERMAN
(MBB-UT-13-81-O) Avail: NTIS HC A02/MF A01

The use of carbon fiber reinforced plastics as a substitute for light weight metals in aircraft construction, which decreases the weight by 30%, is discussed. Environmental parameters, like temperature and humidity must be considered. A construction method with a variety of possibilities to fulfill these requirements and which competes with metal structures is developed. This means either a simplified weight reduction at the same or less cost, or a less costly method for the same or less weight.
Transl. by E.A.K.

N82-18214# European Space Agency, Paris (France).
TENDENCIES IN THE DEVELOPMENT OF SUBSONIC TRANSPORT AIRCRAFT WITH SPECIAL CONSIDERATION OF AERODYNAMICS
Horst Koerner Oct. 1981 42 p refs Transl. into ENGLISH of "Entwicklungstendenzen bei Unterschall-Transportflugzeugen unter besonderer Beruecksichtigung der Aerodynamik", Rept. DFVLR-Mitt-80-15 Brunswick, Jun. 1981 62 p
(ESA-TT-705; DFVLR-Mitt-80-15) Avail: NTIS HC A03/MF A01

Tendencies in subsonic transport aircraft development, specifically due to progress in aerodynamics, are surveyed. Prospective wing profile designs and improved integration of body dimensions are considered, citing examples from the AIRBUS development program. Possible fuel savings through supercritical wing technology and by optimizing reduction in friction drag are also studied. Advantages to be gained by active control, particularly from adaptive wing technology, are reviewed. As a potential application, an unconventional canard configuration, including transonic propellers, for an aircraft in the AIRBUS class is proposed. Author (ESA)

N82-18126# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
A COMPLETE METHOD FOR COMPUTATION OF BLADE MODE CHARACTERISTICS AND RESPONSES IN FORWARD FLIGHT
J. P. Lefrancq and B. Masure *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 9 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18127# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. fuer Aeroelastik.
MODAL CHARACTERISTICS OF ROTOR BLADES: FINITE ELEMENT APPROACH AND MEASUREMENT BY GROUND VIBRATION TEST
D. Ludwig *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18129# Westland Helicopters Ltd., Yeovil (England). Dynamics Dept.
A STUDY OF THE TECHNIQUES OF DYNAMIC ANALYSIS OF HELICOPTER TYPE STRUCTURES
G. M. Venn and D. J. Boon *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18130# Virginia Polytechnic Inst. and State Univ., Blacksburg.
THE EFFECTS OF SLIGHT NON-LINEARITIES ON MODAL TESTING OF HELICOPTER-LIKE STRUCTURES
D. J. Ewins (Imperial College of Science and Technology) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 11 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18139# Italian Air Force Pratica di Mare, Rome. Flight Test Centre.
PARAMETRIC CRITERIA AND IMPACT ON DESIGN TRENDS
Roberto dePompeis and Fulvio Gagliardi (Ministry of Defence) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18140# Hughes Helicopters, Culver City, Calif.
DESIGN PHILOSOPHY OF THE HUGHES MODEL 600 HELICOPTER
R. S. Taylor *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18141# United Technologies Corp., East Hartford, Conn. Aircraft Div.
SH-60B TEST PROGRAM
Frederick J. Silverio *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18142# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
NAVAL VERSIONS OF THE DAUPHIN AND THE AS 15 TT WEAPON SYSTEM
J. P. Dubreuil *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 10 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18143# Westland Helicopters Ltd., Yeovil (England).
ARMY LYNX: PRODUCT DEVELOPMENT MATCHED TO MILITARY COMBAT DEVELOPMENT
D. A. S. Howell *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18144# Societe Nationale Industrielle Aerospatiale, La Courneuve (France).
A LIGHT HELICOPTER FOR NIGHT FIRING
J. F. Candau *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 18 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18145# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
TETHERED ROTORPLATFORMS AND THEIR MISSION POTENTIAL
W. Goeller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 13 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18150# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
FLIGHT CHARACTERISTICS DESIGN AND DEVELOPMENT OF THE MBB/KHI BK117 HELICOPTER
H. Huber and T. Masue (Kawasaki Heavy Industries) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18151# Politecnico di Milano (Italy). Dipartimento di Ingegneria Aerospaziale.
A GENERAL PURPOSE PROGRAM FOR ROTOR BLADE DYNAMICS
M. Borri, M. Lanz, and P. Mantegazza *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18154# Westland Helicopters Ltd., Yeovil (England).
THE ROLE OF SIMULATION IN THE DESIGN PROCESS
I. F. Montgomerie and G. C. F. Wyatt *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18155# Royal Aircraft Establishment, Farnborough (England).
PRELIMINARY INVESTIGATION INTO THE ADDITION OF AUXILIARY LONGITUDINAL THRUST ON HELICOPTER AGILITY
P. J. Legge, P. W. Forestcue (Southampton Univ.), and P. Taylor (Southampton Univ.) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18156# National Defence Academy, Yokosuka (Japan). Dept. of Aeronautical Engineering.
OPTIMUM PERFORMANCE AND WAKE GEOMETRY OF CO-AXIAL ROTOR IN HOVER
Tomoari Nagashima and Kenji Nakanishi *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18159*# Ohio State Univ., Columbus. Dept. of Mechanical Engineering.
HOVER TESTS OF A MODEL H-FORCE ROTOR
H. R. Velkoff *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
(Contract NCA2-OR565-001)
Avail: NTIS HC A99/MF A01

N82-18161# Office National d'Etudes et de Recherches Aeronautiques, Paris (France).
APPLICATION OF THE ONER DYNAMIC STALL MODEL TO A HELICOPTER BLADE IN FORWARD FLIGHT
C. T. Tran and D. Falchero (SNIAS, Marignane, France) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 26 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18165# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

IMPACT OF SYSTEMS TECHNOLOGY AND INTEGRATION ON HELICOPTER DESIGN
K. Schymanietz *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 20 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18170# Bodenseewerk Geraetetechnik G.m.b.H., Ueberlingen (West Germany).
A REDUNDANCY CONCEPT FOR A DIGITAL CSAS
P. Wuest and M. Keller *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 12 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18171# Newmark (Louis) Ltd., Croydon (England).
THE INFLUENCE OF SENSOR AND ACTUATOR CHARACTERISTICS ON OVERALL HELICOPTER AFCS DESIGN
S. G. Spreadborough *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-18215 Royal Aircraft Establishment, Farnborough (England).
NEW DEVELOPMENTS IN COCKPIT-HUMAN INTERFACES
E. B. Davies and J. B. Peckham 15 Jun. 1981 16 p Presented at 12th ICAS Congr., Munich, Oct. 1980
(RAE-TM-FS-412; BR80500) Copyright. Avail: Issuing Activity

Touch sensing displays, helmet sights, and direct voice inputs (DVI) are discussed. Cathode ray tubes (CRT) are cheaper than keyboards for touch sensing, but lack tactile differentiation capabilities. For designation tasks, e.g., touching the required radar return, accuracy must be much higher than for keyboarding. Head movement filtering is a problem with helmet sights, since output is delayed if too much filtering is attempted, and accuracy suffers if vibration is ignored. Cuing by LED's is restricted by the number of leads the helmet can incorporate, and CRT's are too heavy. Factors affecting DVI performance include electronic noise on intercoms, microphone to mouth distance, voice changes caused by stress, and the number of commands pilots can remember. Author (ESA)

N82-18216# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AN ON BOARD SUPERVISORY SYSTEM FOR APPLICATIONS IN SPACE MISSIONS [UM SISTEMA DE SUPERVISAO DE BORDO PARA APLICACOES EM MISSOES ESPACIAIS]
Jose Carlos Maldonado and Ricardo deAzevedo Mendes Jun. 1981 13 p refs In PORTUGUESE; ENGLISH abstract Presented at the 2nd Natl. Automation Meeting, Salvador, Bahia, Brazil, Jul. 1981
(INPE-2097-RPE/327) Avail: NTIS HC A02/MF A01

The system, developed in the digital and analog system group/program, enables full duplex communication between an onboard and a ground microcomputer, based on a reserved protocol. The system performs the following functions: data acquisition, control, transmission and reception between an onboard payload and a ground station. It also executes housekeeping tasks and telecommand operations. This systems was, in particular, utilized in the balloon mission PEROBA-I. The performance of the system in the mission was satisfactory. T.M.

N82-18217# Hughes Aircraft Co., Canoga Park, Calif.
ANALYSIS OF BUILT-IN-TEST (BIT) FALSE ALARM CONDITIONS Final Technical Report, 24 Jan. 1980 - 28 Feb. 1981
John G. Malcolm and Richard W. Highland Griffiss AFB, N.Y. RADC Aug. 1981 122 p refs
(Contract F30602-80-C-0074; AF Proj. 2338)
(AD-A108752; RADC-TR-81-220) Avail: NTIS HC A06/MF A01 CSCL 14/2

Usefulness of BIT is seriously affected by the presence of false alarms. False alarms can degrade mission effectiveness of systems and contribute to the expenditure of excessive maintenance resources. The objectives of this study were to determine the root causes of the false alarm problem and to develop design guidelines to minimize the occurrence and the effect of false alarms. False alarm rates have been established for the three systems investigated and prediction factors defined. Author (GRA)

N82-18218# Lockheed-Georgia Co., Marietta.
ANALYTICAL STUDY OF COCKPIT INFORMATION REQUIREMENTS Final Report, Oct. 1979 - Nov. 1980
J. D. Caldwell and T. G. Jones Washington FAA Apr. 1981 165 p refs
(Contract DOT-FA79WA-4368)
(AD-A108524; LG80ER0200; FAA/RD-81/4) Avail: NTIS HC A08/MF A01 CSCL 01/3

An assessment is made of cockpit information requirements likely to be imposed on aircraft in the next fifteen years as a result of improvements in the ATC system and in aircraft design. These requirements are analyzed by work centers and include flight control, navigation, collision avoidance, flight management, communications, caution/warning and monitoring, and checklist functions. From a baseline of current requirements and technology, the application of new requirements and technology is analyzed. Three aircraft are hypothesized representing three time periods of technical development. The purpose is to investigate the impact of future ATC changes on differently equipped aircraft. GRA

N82-18219# Arinc Research Corp., Annapolis, Md.
IMPACT OF TECHNOLOGY ON AVIONICS COST TRENDS
Steven Toth, William Lovelace, and Kelly Markin Nov. 1981 84 p
(Contract DTFA-01-80-C-10030)
(AD-A108494; Rept-1378-40-2-2553; FAA-EM-82-6) Avail: NTIS HC A05/MF A01 CSCL 09/3

This study provides an overview of nonmilitary generally aviation and commercial avionics price and cost structures as influenced by technology. It quantifies, computes, and evaluates the unique characteristics and behavior patterns of the industry, especially those that affect the frequency of innovation, the rate of technology diffusion from manufacturer to manufacturer or from product to product, and the anticipated major cost drivers of the future. The report reviews the impact of technology on the cost of avionics during the past 20 years and projects this impact for the next 20 years. This report concentrates on avionics in the low-performance general aviation aircraft category because they are the major components of the avionics industry. Typical units of detailed study are transponders, transceivers, navigation receivers, and course deviation indicators (CDIs). An examination of the price histories of more than twenty equipment families indicates that unit prices have been and are likely to continue increasing at the Producer Price Index (PPI) rate. This rate of price growth results from a balance between costs rising at the Consumer Price Index (CPI) rate and manufacturing cost reductions made possible through the introduction of new technologies. Author (GRA)

N82-18220# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
TRENDS IN AIRLINE AVIONICS
F. J. Abbink 13 Mar. 1980 30 p refs Presented at Netherlands Assoc. of Aeron. Engr. Symp. on Develop. in Avionics, Delft, 25 Apr. 1980
(NLR-MP-80013-U) Avail: NTIS HC A03/MF A01

The evolution of aeronautical electronics is described. Trends towards system integration for airliners are indicated. The development of airline avionics specifications by the airlines and constructors is outlined. The design and function of avionics equipment, e.g., navigation aids, are explained. The Aeronautical Radio Incorporated 700 automatic flight system is introduced as an example of a system suited to the next generation of

airliners. Radio navigation, communication and identification equipment are controlled by the digital frequency/function selection unit. Automatic flight control and auto-throttle functions are executed by flight control and thrust control computers.
Author (ESA)

N82-18221# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
INTEGRATION OF COMPLEX SYSTEMS IN CURRENT AND FUTURE AIRCRAFT PROJECTS FOR THE EXAMPLE OF AVIONICS [INTEGRATION KOMPLEXER SYSTEME IN LAUFENDE UND ZUKUENFTIGE FLUGZEUGPROGRAMME AM BEISPIEL DER AVIONIK]
H. Haeuser 31 Jan. 1980 38 p In GERMAN
(MBB-UH-18-80-0) Avail: NTIS HC A03/MF A01

Equipment for electrical and avionic systems, and special equipment needed in the airplane program were developed. Avionics is defined as: airplane structure, airplane equipment (besides the mechanical system) includes that part of the equipment system which is supported by the electric and electronic system, and construction and general instruments necessary in airplane construction. Avionics enables the supply, transfer, processing, and production (activation) of information for the management of airplane systems, control of airplanes, and the execution of special functions. Transl. by E.A.K.

N82-18166# Army Aviation Research and Development Command, St. Louis, Mo.
REVIEW OF HELICOPTER MAST MOUNTED SIGHT (MMS) BASE MOTION ISOLATION AND LINE-OF-SIGHT (LOS) STABILIZATION CONCEPTS
Daniel P. Schrage *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18167# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
MAST MOUNTED VISUAL AIDS
R. D. vonReth *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 24 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18168# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.
EXPERIMENTAL INVESTIGATION OF VISUAL AIDS FOR HELICOPTERS: LOW LEVEL FLIGHT AT NIGHT AND POOR VISIBILITY
R. Beyer, E. Danneberg, E. Kohnen, and H. Stein *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 15 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18169# Litton Systems (Canada) Ltd., Toronto (Ontario). Advance Programs.
THE MULTI MODE MATRIX FLAT PANEL DISPLAY: TECHNOLOGY AND APPLICATIONS
A. Moffat and P. Wright *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18172# Institut fuer Flugmechanik, Brunswick (West Germany).
EVALUATION OF THE HELICOPTER LOW AIRSPEED SYSTEM LASSIE
J. Kaletka *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 23 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18173# Elektronik-System G.m.b.H., Munich (West Germany).
INTEGRATION OF INERTIAL SENSORS IN HELICOPTERS
Volkmar Held *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-18222*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF FAN INLET TEMPERATURE DISTURBANCES ON THE STABILITY OF A TURBOFAN ENGINE
Mahmood Abdelwahab Dec. 1981 36 p refs
(NASA-TM-82699; E-982) Avail: NTIS HC A03/MF A01 CSCL 21E

The effects of steady-state and time-dependent fan inlet total temperature disturbances on the stability of a TF30-P-3 turbofan engine were determined. Disturbances were induced by a gaseous-hydrogen-fueled burner system installed upstream of the fan inlet. Data were obtained at a fan inlet Reynolds number index of 0.50 and at a low-pressure-rotor corrected speed of 90 percent of military speed. All tests were conducted with a 90 deg extent of the fan inlet circumference exposed to above-average temperatures. T.M.

N82-18223# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany).
FURTHER DEVELOPMENT OF THE TEST CONCEPT OF THE ALPHA JET ENGINE LARZAC 04 [WEITERENTWICKLUNG DES PRUEFKONZEPTES FUER DAS ALPHA-JET-TRIEBWERK LARZAC 04]
Ernst Lerche 1981 33 p In GERMAN Presented at Seminars Prueftech. und Pruefstandstech., Hannover, 3 Apr. 1981
Avail: NTIS HC A03/MF A01

The test stand for the LARZAC 04 jet unit for the Alpha jet aircraft was developed. The test stand is outlined, and equipment extension, and a maintenance procedure for the driving system are presented. Transl. by E.A.K.

N82-18132# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
PREDICTION OF OFF-DESIGN PERFORMANCE OF TURBO-SHAFT ENGINES A SIMPLIFIED METHOD
H. Wittenberg *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18133# Rolls-Royce Ltd., Watford (England).
MEASUREMENT TECHNIQUES USED TO ASSESS THE INSTALLED POWER OF A HELICOPTER ENGINE
T. G. Morton *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p Original contains color illustrations (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18134# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
COMPONENT DESIGN AND DEVELOPMENT FOR FUTURE HELICOPTER ENGINES
Jean Hourmouziadis and Horst B. Kreiner *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 19 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18135# General Electric Co., Cincinnati, Ohio. Systems and Controls.
THREE-ENGINE CONTROL SYSTEM FOR THE PROTOTYPE EH-101 HELICOPTER
E. A. Chiuchiolo and J. J. Curran *In* DGLR Seventh European

Rotorcraft and Powered Lift Aircraft 1981 10 p refs (For primary document see N82-18119 09-01)
(AEBG-9/81-1568L) Avail: NTIS HC A99/MF A01

N82-18136# I.A.M. Rinaldo Piaggio, Finale Ligure (Italy).
ENGINE SUPERFICIAL TEMPERATURE AND INFRARED SIGNATURE
A. M. Ricci, A. N. Allavena, and W. Esposti (I.C.I.T.E., S. Giuliano Milanese, Italy) *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 17 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-18224# Honeywell Systems and Research Center, Minneapolis, Minn. Aerospace and Defense Group.
INTEGRATED CONTROL DESIGN TECHNIQUES Final Report, Jun. 1979 - Nov. 1980
A. L. Jones, J. K. Mahesh, M. A. Kollodge, D. P. Pledger, E. R. Rang, and K. D. Graham Wright-Patterson AFB, Ohio AFWAL Aug. 1981 314 p refs
(Contract F33615-79-C-3609; AF Proj. 2403)
(AD-A108223; Rept-80SRC82; AFWAL-TR-81-3074) Avail: NTIS HC A14/MF A01 CSCL 01/3

A total systems approach methodology and computer-aided design tool for integrated flight control design and evaluation has been formulated. This methodology is a composition of classical system design steps and system performance, reliability/survivability, packaging and cost evaluation techniques assembled for interactive computer-based execution. The interactive sensor integration program developed under this methodology addresses the sensor requirements of the flight control, guidance and navigation, and weapon delivery functions as directed interactively by the designer and the mission, the system configuration, cost, power, weight, volume constraints and total system performance. The demonstration program contains performance reliability, size, power, weight, cost data for gyros, accelerometers, radars, seekers and air data systems in addition to analysis tools for evaluating navigation system accuracy, probability of target acquisition, and probability of kill for selected targets and weapons.
Author (GRA)

N82-18153# National Aerospace Lab., Amsterdam (Netherlands).
A CONTROL MODEL FOR MANEUVERING FLIGHT FOR APPLICATION TO A COMPUTER-FLIGHT TESTING PROGRAM
H. Haveridings *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 16 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-18225# Instituut TNO voor Bouwmaycrialen en Bouwconstructies, Delft (Netherlands).
INVESTIGATION INTO THE UTILITY OF SOME QUICK SETTING CEMENTS FOR RUNWAY REPAIR [ONDERZOEK NAAR DE BRUIKBAARHEID VAN ENKELE SNELVERHARDENDE BINDMIDDELEN VOOR REPARATIE VAN STARTBANEN]
Mar. 1980 39 p refs In DUTCH
(B-80-157/60.7.0157; TDCK-75056) Avail: NTIS HC A03/MF A01

The application of quick setting cements in rapid runway repair was investigated. Needed strength and layer thickness of the hardening material was determined. The following results are reported: (1) it is possible to fill up a hollow space with quick setting cements, even in combination with proper additives like super plastifiers; (2) pressure strength for hardening time is accomplished within one hour; (3) a fast operating method is needed to prevent debinding of cement, continuous mixers for smaller quantities are recommended. Transl. by E.A.K.

N82-18226# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
THE LINK-HILES DRIVER TRAINING SIMULATOR FOR TRACKED VEHICLES: THE EFFECT OF METHOD AND DURATION OF TRAINING ON THE TRANSFER OF TRAINING
K. J. Poll 1980 20 p refs In DUTCH; ENGLISH summary
(Contract A76/KL/148)
(IZF-1980-28; TDCK-75019) Avail: NTIS HC A02/MF A01

Transfer of training through different methods and durations of training from a driving simulator to a task was investigated. In method A the candidates were under strict guidance of the instructor, while in method B the candidates trained more on their own and paid more attention to the integration of the part-tasks. The duration of training was dependant on the performance-level on which the candidate turned over from the simulator to the real tanks. These performance-levels were: the single trial execution of all tasks (low level), having all tasks under control (medium level), and sufficient integration of all part-tasks (high level). From the results it is clear that when the candidates were trained in pairs the mean number of kilometers for the two candidates shows to difference as a function of training method. Although the 'first' candidate needs less kilometers with method B, and 'second' candidate learns more from the 'first' with method A. The number of kilometers on the tank, necessary to pass the final driver's test, is a linear relation as a function of the duration of simulator training.
J.M.S.

N82-18227# Coppin State Coll., Baltimore, Md.
TASK ANALYTIC TECHNIQUES: APPLICATION TO THE DESIGN OF A FLIGHT SIMULATOR INSTRUCTOR/OPERATOR CONSOLE Final Report
Charles D. Sanders Brooks AFB, Tex. Air Force Human Resources Lab. Dec. 1981 21 p refs Prepared for Southeastern Center for Electrical Engineering Education, St. Cloud, Fla. Submitted for publication
(Contract F49620-79-C-0038; AF Proj. 9983)
(AD-A108724; AFHRL-TP-81-38) Avail: NTIS HC A02/MF A01 CSCL 14/2

Instructional Systems Development (ISD) has contributed to the efficiency and low cost of air flight training through the medium of the simulator. Task analysis is a component of ISD, and its application to the improvement of devices such as simulator instructor/operator consoles will continue to enhance the quality of flight training. Task analytic techniques are inextricably interwoven into the design of an instructor/operator console. The application involves the process, persons, and a machine within the context of a flight simulator. The tasks of the instructor and student are primary in the design process. The efficiency and economy of the task analytic process has implications for its use in the future developments of automated flight training.
Author (GRA)

N82-18228# SRI International Corp., Arlington, Va.
EVALUATION OF THE NORTH ISLAND A/C CRASH/RESCUE TRAINING FACILITY
R. S. Alger Aug. 1981 153 p refs
(Contract N00014-80-C-0696; SRI Proj. PYU-1943)
(AD-A108740) Avail: NTIS HC A08/MF A01 CSCL 05/9

Under Executive Order 11752, the Navy and the Air Force began a cooperative effort to develop training facilities that could provide more fire fighting training with less smoke and water pollution. Soon the central issue of pollution control was surrounded by a series of satellite questions that had to be

answered before training facilities could be designed, e.g., what type of training is required; how much training should be provided; where should fireman train; and how much departure from the real emergency situation is permissible. Various public and private groups contributed answers. The Naval Air Station, North Island, San Diego, Calif., Aircraft/Crash Fire Rescue Training Facility is the first Navy facility constructed as an outgrowth of this effort to improve training while reducing the environmental impact to an acceptable level. This report evaluates the performance of the North Island facility in a series of environmental and training tests. The scope includes: (1) the evaluation procedure and results; (2) a comparison to other training options; and (3) recommendations for future training activity. GRA

N82-18229# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
BOMB CRATER REPAIR TECHNIQUES FOR PERMANENT AIRFIELDS. REPORT 1: SERIES 1 TESTS Technical Report, Jul. - Nov. 1978
David L. Cooksey Oct. 1981 129 p refs
(AD-A108716; WES/MP/GL-81-12) Avail: NTIS HC A07/MF A01 CSCL 13/2

A test section with six simulated bomb craters was constructed for the purpose of developing an improved field method of repair and restoration of air base runways damaged by enemy attack. The crater repair materials tested in the reconstruction were a high-quality crushed stone, grouted concrete, portland cement concrete (PCC), and asphaltic concrete (AC). The performances of the different materials were evaluated under full-scale load testings with the F-4 and C-141 aircraft loadings. The gravity grout solution and the high-quality crushed stone method performed beyond required coverage levels and seem to be the two high candidate material systems for further research. The solutions were accomplished with the time, manpower, equipment, and performance constraints of operational requirements. GRA

N82-18230# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
INVESTIGATION OF COMPACTION CRITERIA FOR AIRPORT PAVEMENT SUBGRADE SOILS Final Report, Mar. 1978 - Apr. 1981
William N. Brabston Washington, D.C. FAA Oct. 1981 174 p refs
(Contract DOT-FA78WAI-876)
(AD-A108518; WES/TR/GL-81-11; FAA-RD-81-48) Avail: NTIS HC A08/MF A01 CSCL 08/13

A study was conducted to determine the effect of lowering soil density requirements for subgrades under airport pavements. The investigation was primarily a laboratory effort in which molded specimens of three different soil types, compacted to densities at and below those currently specified by FAA criteria, were subjected to repeated axial loadings in a triaxial compression chamber. The primary response parameters of interest were permanent and resilient axial strain. Test results were formulated into a statistical model to predict permanent soil strain based on soil characteristics such as density, clay content, compaction characteristics, and sheer strength. The strain model was used to calculate values of permanent soil deformation at the surface of the subgrade for various combinations of soil density. Results of the test indicated that the wide variation in soil response among the three materials tested precluded any general alteration in current FAA compaction criteria. Author (GRA)

N82-18231# Textron Bell Helicopter, Fort Worth, Tex.
ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM C81 WITH DATAMAP INTERFACE. VOLUME 2: PROGRAMMER'S MANUAL Final Report
P. Y. Hsieh Oct. 1981 264 p Supersedes USAAMRDL-TR-76-41A, USAAMRDL-TR-76-41B, and USAAMRDL-TR-76-41C
(Contract DAAK51-79-C-0015; DA Proj. 1L1-62209-AH-76)
(AD-A108294; BHT-699-099-111-Vol-2; USAAVRADCOM-TR-80-D-38B; USAAMRDL-TR-76-41A; USAAMRDL-TR-76-41B; USAAMRDL-TR-76-41C) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAP80. The accompanying program for calculating fully coupled rotor blade mode shapes is called DNAM05, and an associated rotor wake program is called AR9102. The AGAP80 version of C81 was developed by adding some analytical features to the AGAJ76 version and including the ability to generate Data Transfer Files for use by the File Creation Program of DATAMAP. An overview of the computer program capabilities and the principal mathematical models incorporated in the program are given in Volume I of the documentation for the AGAJ76 version of the program. Volume I, the User's Manual, contains detailed information necessary for setting up an input data deck and interpreting the computed data. Volume II, includes a catalog of subroutines and a discussion of programming considerations. GRA

N82-18232# Naval Air Engineering Center, Lakehurst, N.J. Ship Installation Engineering Dept.
INVESTIGATION OF CROSSDECK PENDANT CATAPULT SLOT INTERACTION; PROPOSED CORRECTIVE MEASURES Final Report, Apr. 1978 - Mar. 1979
Alvin Hittner 20 Nov. 1981 56 p ref
(AD-A108149; NAEC-91-7964) Avail: NTIS HC A04/MF A01 CSCL 01/5

This report documents the investigation of the crossdeck pendant failure aboard USS JOHN F. KENNEDY (CV 67) in March 1978, which caused the loss of an F-14A. Included are the results of a survey to determine the scope of the deck pendant/catapult slot interaction problem, testing to confirm the failure sequence, and the evaluation of slot filler devices (buttons) to resolve the problem. Author (GRA)

N82-18233# MGA Research Corp., Buffalo, N.Y.
TEST SITE INSTRUMENTATION STUDY. VOLUME 2: CRASH 1 AND CRASH 2 RAW DATA Final Report, 22 Mar. 1980 - 31 Mar. 1981
Rudy H. Arendt and Patrick M. Miller Jun. 1981 150 p refs
(Contract DOT-HS-8-01936)
(PB82-111832; G22-V-2; DOT-HS-805980-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 13F

The data acquisition and reduction practices at fifteen crash and sled testing facilities which normally produce impact test data for the NHTSA were reviewed. Attention was focused on dynamic response characteristics, instrumentation calibration procedures, filtering techniques, equipment properties and analog to digital conversion techniques. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-18234*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB MISSION 1 EXPERIMENT DESCRIPTIONS SECOND EDITION
Paul D. Craven, ed. Nov. 1981 154 p Revised Prepared jointly with ESA, Paris Original contains color illustration
(NASA-TM-82448; ESA/FSLP-EX-001) Avail: NTIS HC A08/MF A01 CSCL 22A

Brief descriptions of experiments and their instrumentation selected for the flight of Spacelab 1 are presented. For individual titles, see N82-18235 through N82-18269.

N82-18235*# Michigan Univ., Ann Arbor.
AN IMAGING SPECTROMETRIC OBSERVATORY c74
M. R. Torr *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 20F

Measurement of the airglow spectrum from the extreme ultraviolet to the infrared using five identical imaging scanning spectrometers is planned. Functions and operation of the instrument are described. J.D.H.

N82-18236*# Institut d'Aeronomie Spatiale de Belgique, Brussels.

GRILLE SPECTROMETER **c35**

M. Ackerman and A. Girard (ONERA) *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14B

High resolution infrared spectroscopic observations of the Earth's limb in the wavelength range characteristic of the vibrational-rotational lines of trace atmospheric constituents is planned. The instrument and its operation and the purpose of the experiments are summarized. J.D.H.

N82-18237*# Centre National de la Recherche Scientifique, Paris (France). Service d'Aeronomie.

WAVES IN THE OH EMISSIVE LAYER **c35**

M. Herse *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

Photography and measurement of cloud-like structures of bright parallel bands observed in near infrared photography of the night sky is planned. The instrument is described and the purpose of the experiment summarized. J.D.H.

N82-18238*# Centre National de la Recherche Scientifique, Paris (France). Service d'Aeronomie.

INVESTIGATION ON ATMOSPHERIC H AND D THROUGH THE MEASUREMENT OF THEIR LYMAN-ALPHA EMISSIONS **c46**

J. L. Bertaux *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

Study of sources of Lyman-alpha emission in the atmosphere, in the interplanetary medium, and perhaps in the galactic medium is planned. Sources of Lyman-alpha emission are described and a schematic of the instrument presented. J.D.H.

N82-18239*# European Space Conference, Paris (France).

METRIC CAMERA EXPERIMENT **c35**

M. Reynolds *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

A test of the mapping capabilities of high resolution space photography taken at the resolution limit of image motion on large film format is planned. The metric camera system and its planned operation are described. J.D.H.

N82-18240*# European Space Conference, Paris (France).

MICROWAVE REMOTE SENSING EXPERIMENT **c43**

G. Dieterle *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14B

Operation of the microwave instrument as a two frequency scatterometer, a synthetic aperture radar, and a passive microwave radiometer is planned. Operation of the instrument in each of its three modes is discussed and the antenna system described. J.D.H.

N82-18241*# Tokyo Univ. (Japan).

SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS **c46**

Tatsuzo Obayashi *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

The purpose of space experiments with particle accelerators (SEPAC) is to carry out active and interactive experiments on and in the Earth's ionosphere and magnetosphere. It is also intended to make an initial performance test for an overall program of Spacelab/SEPAC experiments. The instruments to be used are an electron beam accelerator, magnetoplasma dynamic arcjet, and associated diagnostic equipment. The accelerators are installed on the pallet, with monitoring and diagnostic observations being made by the gas plume release, beam-monitor TV, and particle-wave measuring instruments also mounted on the pallet. Command and display systems are installed in the module. Three major classes of investigations to be performed are vehicle charge eutralization, beam plasma physics, and beam atmosphere interactions. The first two are mainly onboard plasma physics experiments to measure the effect of phenomena in the vicinity of Spacelab. The last one is concerned with atmospheric modification and is supported by other Spacelab 1 investigations as well as by ground-based, remote sensing observations. A.R.H.

N82-18242*# Centre National d'Etudes des Telecommunications, Bagneux (France).

PHENOMENA INDUCED BY CHARGED PARTICLE BEAMS **c72**

C. Beghin *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 20H

The injection of energetic particles along the Earth's magnetic field lines is a possible remote sensing method for measuring the electric fields parallel to the magnetic field with good time resolution over the entire magnetic field. Neutralization processes, return-current effects, dynamics of the beams, triggered instabilities, and waves must be investigated before the fundamental question about proper experimental conditions, such as energy, intensity and divergence of the beams, pitch-angle injection, ion species, proper probes and detectors and their location, and rendezvous conditions, can be resolved. An experiment designed to provide a better understanding of these special physical processes and to provide some answers to questions concerning beam injection techniques is described. A.R.H.

N82-18243*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Labs.

ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING **c46**

S. B. Mende *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

A dual-channel video system mounted on a stabilized two-axis gimbal system (mounted on the pallet) with associated optics and data handling electronics described the low light flux observations are required for: (1) investigating ionospheric transport processes by observing Mg+ ions; (2) supporting magnetospheric electron bounce experiments; (3) measuring electron cross sections for selected atmospheric species; (4) detecting small particle contamination; and (5) studying natural auroras. A.R.H.

N82-18244*# Max-Planck-Institut fuer Aeronomie, Hanover (West Germany).

LOW-ENERGY ELECTRON FLUX AND ITS REACTION TO ACTIVE EXPERIMENTATION OF SPACELAB **c46**

K. Wilhelm *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

An instrument capable of observing the natural electron flux in the energy range from 0.1 to 12.0 kiloelectron volts is discussed for use in an experiment intended as a forerunner of a method that will utilize artificially accelerated electrons as tracer particles for electron fields parallel to the magnetic field. Effects that are of importance either as means of detecting the echo beam or as causes of beam perturbations (e.g., spacecraft charging effects and electron background) are to be studied. The use of electron accelerators as a tool to probe magnetospheric processes rather than to modify them is planned. A.R.H.

N82-18245*# Oesterreichische Akademie der Wissenschaften, Vienna. Space Research Inst.

DC-MAGNETIC FIELD VECTOR MEASUREMENT **c46**

R. Schmidt *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 08N

A magnetometer experiment was designed to determine the local magnetic field by measuring the total of the Earth's magnetic field and that of an unknown spacecraft. The measured field

vector components are available to all onboard experiments via the Spacelab command and data management system. The experiment consists of two parts, an electronic box and the magnetic field sensor. The sensor includes three independent measuring flux-gate magnetometers, each measuring one component. The physical background is the nonlinearity of the B-H curve of a ferrite material. Two coils wound around a ferrite rod are necessary. One of them, a tank coil, pumps the ferrite rod at approximately 20 kilohertz. As a consequence of the nonlinearity, many harmonics can be produced. The second coil (i.e., the detection coil) resonates to the first harmonic. If an unknown dc or low-frequency magnetic field exists, the amplitude of the first harmonic is a measure for the unknown magnetic field. The voltages detected by the sensors are to be digitized and transferred to the command and data management system. A.R.H.

N82-18246*# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.

ISOTOPIC STACK - MEASUREMENT OF HEAVY COSMIC RAY ISOTOPES **c93**

R. Beaujean *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03B

Heavy cosmic ray nuclei with nuclear charge, Z, equal to or greater than 3 are to be measured using an isotopic stack consisting of passive visual track detectors which remain sensitive throughout the entire mission. The scientific data are stored in latent tracks which are produced by heavy ions and which can be revealed in the investigator's laboratory after recovery. During the mission, only housekeeping data have to be collected. The exposure onboard Spacelab 1 allows the study of the chemical composition and energy spectrum of articles which have energies in the range 20 to 100 million electron volts per atomic mass unit, as well as the isotopic composition of heavy galactic cosmic rays with energies in the range 100 to 1000 million electron volts per atomic mass unit. A.R.H.

N82-18247*# European Space Agency, Paris (France).

MATERIALS SCIENCE

U. Huth, Y. Malmejac (CEA), and L. Napolitano (Naples Univ.) *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 16 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 22A

The first Spacelab space processing payload includes the following categories of hardware: (1) multiuser facilities, (2) common-support equipment, and (3) six autonomous experiments. All the hardware, with the exception of two elements (covering three experiments), will be integrated in a Spacelab double rack called the materials science double rack. The payload experimental facilities are intended to perform, during the first Spacelab mission, a number of significant pilot experiments in the fields of crystal growth, fluid physics and metallurgy, and, at the same time, to flight-verify the materials science hardware items developed (e.g., various furnaces, process chambers, etc.). A.R.H.

N82-18248*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

WETTING, SPREADING AND OPERATING CHARACTERISTICS OF BEARING LUBRICANTS IN A ZERO-GRAVITY ENVIRONMENT

C. H. T. Pan (Shaker Research), Ann F. Whitaker, and Raymond L. Gause *In its* Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 22A

The prolonged zero-gravity condition in a Spacelab flight provides a unique opportunity to long-term distribution and movement of a lubricant as well as the dynamic stability mechanism of a journal bearing which is believed to be associated with the two-phase fluid boundary. The tribology experiment assembly includes four wetting and spreading modules, three journal bearing modules, a camera, film, lenses, a three axis low gravity accelerator system, and an electronics assembly. A.R.H.

N82-18249*# California Univ., Berkeley.

FAR ULTRAVIOLET ASTRONOMY USING THE FAUST TELESCOPE **c89**

C. S. Bowyer *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03A

The Far Ultraviolet Space Telescope (FAUST) a compact, wide field-of-view, far ultraviolet instrument designed for astronomical observations of extended and point sources is discussed. The design and application of the instrument are described. The prime objective is to observe faint astronomical sources with sensitivities higher than previously available. Scientific programs will include: (1) a search for ultraviolet stars which are predicted to exist at the stage of evolution prior to the final death of a star; (2) observations of galaxies and quasars; and (3) joint programs with other Spacelab 1 experiments. The secondary objective is to verify the suitability of the Spacelab as a platform for far ultraviolet astronomy: data will be provided on the ultraviolet background levels due to astronomical, terrestrial, and spacecraft generated sources; the levels of contaminants which affect ultraviolet instruments; and the capability of the Orbiter for stable pointing at celestial sources for useful periods of time. E.A.K.

N82-18250*# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).

VERY WIDE FIELD CAMERA **c35**

G. Courtes *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 14E

The study of galactic and faint extragalactic extended sources and peculiar ultraviolet objects by a very wide field of view camera, operated in the ultraviolet photometric and spectrometric modes is discussed. The photometric mode is direct photography through filters for observation of the following sources: (1) large scale distribution of ultraviolet radiation in the Milky Way; (2) diffusion of the galactic light above the galactic plane and in front of the large absorbing clouds; (3) the optical emission of the interstellar matter; (4) stars, and starlike objects with diameters less than 3 arc minutes. In the spectrometric mode (nebular spectrograph) the light from the center of the photometric field is concentrated on a slit covering 10 degrees by 10 arc minutes on the sky. E.A.K.

N82-18251*# European Space Technology Center, Delft (Netherlands).

SPECTROSCOPY IN X-RAY ASTRONOMY **c89**

R. Andresen *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03A

Detailed features in cosmic X-ray sources and their associated temporal variation over a wide energy range were studied. Excess emission and absorption at approximately 6 to 7 kiloelectron volts in the spectra of supernova remnants, binary X-ray sources, and clusters of galaxies were observed. A gas scintillation proportional counter (GSPC) will be used as the detector system. In the gas scintillator the principal limitation is due to the statistics of the initial ionization process only. E.A.K.

N82-18252*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ACTIVE CAVITY RADIOMETER **c35**

R. C. Willson *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 14B

The active cavity radiometer (ACR) experiment on the Spacelab 1 mission to measure the total solar irradiance is discussed. Short and long term variations in the total solar output of optical energy are studied. Solar total irradiance observation provides information on the solar cycle and other long term trends in solar output that are of climatological significance as well as short term solar physics phenomena. The interaction of solar radiation with the Earth's atmosphere, oceans, and land masses provides the primary driving forces for the formation of

weather systems and the determination of climate. Astrophysical measurements determine the total energy flux. The principal role of the ACR observations support extended solar irradiance experiments on free flying satellites. Solar irradiance measurements are important in the establishment of the radiation scale at the solar total flux level in the international system of units (SI). E.A.K.

N82-18253*# Institut Royal Meteorologique de Belgique, Brussels.
MEASUREMENT OF THE SOLAR CONSTANT c92
D. Crommelynck *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 03B

The absolute value of the solar constant and the long term variations that exist in the absolute value of the solar constant were measured. The solar constant is the total irradiance of the Sun at a distance of one astronomical unit. An absolute radiometer removed from the effects of the atmosphere with its calibration tested in situ was used to measure the solar constant. The importance of an accurate knowledge of the solar constant is emphasized. E.A.K.

N82-18254*# Centre National de la Recherche Scientifique, Paris (France).
SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS c92
G. Thuiller *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 03B

The spectral irradiance of the Sun between 170 and 3200 nanometers was measured to determine accurately the solar constant, its possible variation with the solar cycle, and the wavelength range responsible for the observed variations. It is pointed out that measurements over very long time periods (10 years) involving flights of the same instrument on future Spacelab missions will be required. Few spectral solar irradiation measurements ranging from the near ultraviolet to the near infrared have been performed yet. The most extensive solar irradiation measurements were obtained by a spectrometer onboard an aircraft or from high altitude observatories. The full disk irradiation flux was measured, corrections for atmospheric absorption are applied in all of the measurements. E.A.K.

N82-18255*# Mainz Univ. (West Germany).
EFFECTS OF RECTILINEAR ACCELERATION, OPTOKINETIC AND CALORIC STIMULI IN SPACE c52
R. vonBaumgarten *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 5 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

The set of experiments comprising the Spacelab 1ES201 package designed to investigate the human vestibular system and equilibratory function in weightlessness are described. The specific objectives of the experiments include: (1) the determination of the threshold of perception of linear oscillatory motion; (2) measurement of physiological and subjective responses to supra threshold, linear and angular motion stimuli; (3) study of the postural adjustments, eye movements, and illusions of attitude and motion evoked by optokinetic stimuli, (i.e., moving visual patterns) in order to assess visual/vestibular interactions; (4) examination of the effect of thermal stimulations of the vestibular apparatus to determine if the eye movements elicited by the 'caloric test' are used by a density gradient in the semicircular canal; and (5) investigation of the pathogenesis of space motion sickness by recording signs and symptoms during the course of vestibular stimulation and, specifically, when the test subject is exposed to sustained, linear ocillatory motion. M.G.

N82-18256*# Massachusetts Inst. of Tech., Cambridge.
VESTIBULAR EXPERIMENTS c52
L. R. Young *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 5 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

Spacelab experiments designed to investigate space motion sickness, any associated changes in otolith-mediated responses occurring during weightlessness, and the carryover of any such changes to postflight conditions are described. The experiments aimed at assessing otolithic responses in space are intended to clarify presumed alterations in vestibular function during weightlessness. Vestibular function will be investigated at several levels: vestibulo-ocular reflexes, vestibulo-spinal pathways, cortical functions involving perception of motion and spatial orientation, visual vestibular interaction, and motion sickness susceptibility. A second major objective relates to space motion sickness and man's well-being and productivity in space. M.G.

N82-18257*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VESTIBULO-SPINAL REFLEX MECHANISMS c52
M. F. Reschke *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

The specific objectives of experiments designed to investigate postural reflex behavior during sustained weightlessness are discussed. The first is to investigate, during prolonged weightlessness with Hoffmann response (H-reflex) measurement procedures, vestibulo-spinal reflexes associated with vestibular (otolith) responses evoked during an applied linear acceleration. This objective includes not only an evaluation of otolith-induced changes in a major postural muscle but also an investigation with this technique of the adaptive process of the vestibular system and spinal reflex mechanisms to this unique environment. The second objective is to relate space motion sickness to the results of this investigation. Finally, a return to the vestibulo-spinal and postural reflexes to normal values following the flight will be examined. The flight experiment involves activation of nerve tissue (tibial N) with electrical shock and the recording of resulting muscle activity (soleus) with surface electrodes. Soleus/spinal H-reflex testing procedures will be used in conjuction with linear acceleration through the subject's X-axis. M.G.

N82-18258*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE INFLUENCE OF SPACE FLIGHT ON ERYTHROKINETICS IN MAN c52
Carolyn S. Leach *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

An experiment is described the purpose of which is to measure specific factors relative to the control of erythrokinetics in man which might be altered during the first seven days of exposure to the weightless environment of space flight. It is anticipated that these data will provide information relative to the mechanism by which the red cell mass is reduced during space flight. Specifically, the experiment is designed to establish: (1) if there is a significant change in red cell mass and plasma volume during the initial period of exposure to weightlessness; (2) if the plasma concentration of erythropoietin is reduced; (3) if there is an increase in the plasma concentration of erythropoietin inhibitors; (4) if there is a change in the effectiveness of erythropoiesis; and (5) if the number and age distribution of reticulocytes are altered. M.G.

N82-18259*# Freie Univ., Berlin (West Germany). Physiologisches Inst.
MEASUREMENT OF CENTRAL VENOUS PRESSURE AND DETERMINATION OF HORMONES IN BLOOD SERUM DURING WEIGHTLESSNESS c52
K. Kirsch *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

A Spacelab experiment is described which proposes to obtain data on the degree of engorgement of the cephalad circulation during weightlessness by recording central venous pressure. Of practical importance is the question of how close the astronauts are to pulmonary edema and whether the pressure falls toward normal during the time of the mission. Another experiment to investigate deviations from normal fluid and mineral metabolism,

possibly initiated by the central engorgement of the low pressure system, is discussed. Hormones responsible for the control of water and mineral balance (vasopressin, catecholamines, renin, aldosterone, corticosteroids, and prostaglandin E1) will be analyzed from blood samples. M.G.

N82-18260*# Illinois Univ., Urbana.
EFFECTS OF PROLONGED WEIGHTLESSNESS ON THE HUMORAL IMMUNE RESPONSE OF HUMANS **c52**
E. W. Voss, Jr. *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

An experiment to examine the possible interrelationship of various classes of immunoglobulins by utilizing the effect of weightlessness as a stress factor and subsequently measuring inhibitory, compensatory, or enhancing interrelationships. A second objective of the experiment is to investigate the state of immune competency under conditions of sustained weightlessness. M.G.

N82-18261*# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
EFFECT OF WEIGHTLESSNESS ON LYMPHOCYTE PROLIFERATION **c52**
Autusto Cogoli *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

An experiment to study the effect of weightlessness on lymphocyte proliferation to detect possible alteration of the cells responsible for the immune response during long-duration space flights is described. Human lymphocytes in culture medium will be delivered shortly before launch in an incubator which will be kept at 37C. Mitogen will be added to the culture. A control without mitogen will be run in parallel. After 70 hours of incubation, radioactive thymidine will be added. After two hours, cellular activity will be stopped by fixation and incubator power switched off. Later, the amount of incorporated thymidine will be determined and the cell morphology and the distribution of cell organelles will be investigated. R.J.F.

N82-18262*# Rome Univ. (Italy).
THREE-DIMENSIONAL BALLISTOCARDIOGRAPHY IN WEIGHTLESSNESS **c52**
A. Scano *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06E

An experiment is described the aim of which is to record a three dimensional ballistocardiogram under the condition of weightlessness and to compare it with tracings recorded on the same subject on the ground as a means of clarifying the meaning of ballistocardiogram waves in different physiological and perphaps pathological conditions. Another purpose is to investigate cardiovascular and possibly fluid adaptations to weightlessness from data collected almost simultaneously on the same subjects during the other cardiovascular during the other cardiovascular and metabolic experiments. R.J.F.

N82-18263*# Clinical Research Centre, London (England).
PERSONAL MINIATURE ELECTROPHYSIOLOGICAL TAPE RECORDER **c35**
H. Green *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

The use of a personal miniature electrophysiological tape recorder to measure the physiological reactions of space flight personnel to space flight stress and weightlessness is described. The Oxford Instruments Medilog recorder, a battery-powered, four-channel cassette tape recorder with 24 hour endurance is carried on the person and will record EKG, EOG, EEG, and timing and event markers. The data will give information about heart rate and morphology changes, and document adaptation to zero gravity on the part of subjects who, unlike highly trained astronauts, are more representative of the normal population than were the subjects of previous space flight studies. R.J.F.

N82-18264*# Stirling Univ. (Scotland).
MASS DISCRIMINATION DURING WEIGHTLESSNESS **c52**
Helen Ross *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

An experiment concerned with the ability of astronauts to discriminate between the mass of objects when both the objects and the astronauts are in weightless states is described. The main object of the experiment is to compare the threshold for weight-discrimination on Earth with that for mass-discrimination in orbit. Tests will be conducted premission and postmission and early and late during the mission while the crew is experiencing weightlessness. A comparison of early and late tests inflight and postflight will reveal the rate of adaptation to zero-gravity and 1-g. The mass discrimination box holds 24 balls which the astronaut will compare to one another in a random routine. R.J.F.

N82-18265*# Pennsylvania Univ., Philadelphia.
NUTATION OF HELIANTHUS ANNUUS IN A MICROGRAVITY ENVIRONMENT **c51**
Allan H. Brown *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06C

An experiment to gather evidence to decide between the Darwinian concept of endogenously motivated nutation and the more mechanistic concept of gravity dependent nutation is described. If nutation persists in weightlessness, parameters describing the motion will be measured by recording in time lapse mode the video images of a population of seedlings that were grown at 1-g, but which will be observed at virtual zero gravity. Later, the plant images will be displayed on a video monitor in a laboratory, photographed on 16 millimeter film, and analyzed frame by frame to determine the kinetics of nutation for each specimen tested. R.J.F.

N82-18266*# State Univ. of New York at Binghamton.
PRELIMINARY CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS DURING SPACE FLIGHT: NEUROSPORA AS A MODEL SYSTEM **c52**
Frank W. Sulzman *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

The effects of the Spacelab environment on the circadian rhythms in microorganisms are investigated. Neurospora is chosen because of its well characterized circadian rhythm of growth. Growth rate, banding patterns, and circadian period and phase information are studied. B.W.

N82-18267*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Abteilung Biophysik.
MICROORGANISMS AND BIOMOLECULES IN SPACE HARD ENVIRONMENT **c51**
G. Horneck *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06C

Microorganisms and biomolecules exposed to space vacuum and to different intensities of selected wavelengths of solar ultraviolet radiation is studied. The influence of these factors, applied singly or simultaneously, on the integrity of microbial systems and biomolecules is measured. Specifically, this experiment will study in Bacillus subtilis spores (1) disturbances in subsequent germination, outgrowth, and colony formation; (2) photochemical reactions of the DNA and protein in vivo and in vitro and their role in biological injury; and (3) the efficiency of repair processes in these events. B.W.

N82-18268*# San Francisco Univ., Calif.
RADIATION ENVIRONMENT MAPPING **c52**
E. Y. Benton *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 06R

An experimental set up to map the cosmic radiation fieldinside the Spacelab vehicle to determine the potential biological hazards present is described. In addition to the integral linear energy transfer (LET) spectrum for protons and HZE particles, the parameters to be determined include the total radiation dose; fluence of neutrons, protons, and high charge and energy (HZE) particles. These results are to be derived from measurements made in passive dosimeters. B.W.

N82-18269*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Abtelung Biophysik.

ADVANCED BIOSTACK EXPERIMENT c52

H. Buecker *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 06R

The Advanced Biostack Experiment is described. The objectives are: (1) to confirm, complement, and enlarge the information obtained from the previous experiments by applying improved and advanced methods of localization and physical and biological evaluation, performing advanced experiments based on these data, and including additional biological specimens and additional radiation detectors; (2) to determine the biological importance of nuclear disintegration stars; (3) to determine the interference of HZE particle induced effects with those of other space flight factors (e.g., weightlessness); and (4) to determine the distribution of HZE particles and of disintegration stars at different locations inside the module and on the pallet. B.W.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-18270# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

AN ADAPTIVE SATELLITE ORBIT ESTIMATION SCHEME USING AN ANALYTICAL APPROACH AND A DYNAMICAL MODEL COMPENSATION TECHNIQUE

Atair Rios Neto and Ricardo Negreiros dePaiva Jan. 1982 23 p refs Presented at the Intern. Symp. and Workshop on the Motion of Planets and Satellites, Sao Paulo, Brazil, 14-18 Dec. 1981

(INPE-2304-PRE/072) Avail: NTIS HC A02/MF A01

An Earth satellite orbit estimation procedure for real time applications is presented. A perturbed two body physical model is considered for the satellite equations of motion in the mathematical model of the estimator. Using the KS transformation, an analytical solution is obtained in the correspondent parametric transformed space. The perturbations in the Keplarian motion are treated, in the parametric space, as unmodeled accelerations. A dynamical model compensation technique approximates each component of these accelerations by a first order Gauss-Markov process. These accelerations are estimated along with the satellite motion by the definition of an extended state, using the extended Kalman filter. During the estimation process, the observations nonlinearities and the state noise covariance matrix are adaptively determined to prevent filter divergence. Results of numerical tests under simulated conditions are presented and discussed. Author

N82-18271# European Space Agency, Paris (France).

GENERAL STUDY OF OPTIMAL LOW THRUST, LIMITED POWER TRANSFERS BETWEEN ARBITRARY ELLIPTICAL ORBITS

J. P. Marec (ONERA, Chatillon, France) and N. X. Vinh (Michigan Univ.) Nov. 1981 161 p refs Transl. into ENGLISH from "Etude Generale des Transferts Optimaux a Poussee Faible et Puissance Limitee entre Orbites Elliptiques Quelconques", Rept. ONERA-Publ-1980-2 ONERA, Paris, 1981 Original report in FRENCH previously announced as N81-32167

(ESA-TT-697; ONERA-Publ-1980-2) Avail: NTIS HC A08/MF A01

The Edelbaum study which concerns only coplanar and coaxial cases is generalized. The significance of the corresponding time-free, multi-impulse transfers is shown. The concept of mean Hamiltonian was used to write the differential system of optimal trajectories in the space of orbital elements. The orientation-shape subproblem (concerning the orbit orientation and accentricity) and the dimension-time-cost subproblem (concerning the semi-major axis, time law and consumption) were examined.

Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-18272# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A RAPID ESTIMATION OF NEAR EARTH SATELLITE LIFETIMES WITH QUASI-DYNAMIC ATMOSPHERE MODEL WITH APPLICATION TO A PROPOSED BRAZILIAN SATELLITE

Nellore Srinivasan Venkataraman and Kondapalli Rama Rao Dec. 1981 13 p refs Presented at the Intern. Symp. on Workshop on the Motion of Planets and Satellites, Sao Paulo, Brazil, Dec. 1981

(INPE-2287-PRE/063) Avail: NTIS HC A02/MF A01

A method to estimate the orbital lifetime of near Earth satellites using the small perturbation theory is presented. A quasidynamic atmospheric model is used by employing a different exospheric temperature every three months. The drag coefficient is calculated using kinetic theory. The results are validated by applying to several known satellites and comparison with the actual lifetime is very good. The method is then applied to a proposed Brazilian Satellite. Author

N82-18273*# National Aeronautics and Space Administration, Washington, D. C.

INTELSAT V-D (F-4) LAUNCH

1982 21 p

(NASA-TM-84133; O-491-203-82-04) Avail: NTIS HC A02/MF A01 CSCL 22B

Plans for the Intelsat 5D (F4) satellite launch are presented. The spacecraft and its subsystems are described and the mission is summarized. The Atlas Centaur launch vehicle is also described. S.L.

N82-18274*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

LAUNCH MISSION SUMMARY: INTELSAT 5 (F4) ATLAS/CENTAUR-58

22 Feb. 1982 14 p refs

(NASA-TM-84132; KSC-GP-15-26) Avail: NTIS HC A02/MF A01 CSCL 22B

The launch vehicle, spacecraft, and mission are described. Information relative to launch windows, flight plan, trajectory, and radar and telemetry coverage are included with brief sequence of flight events. A.R.H.

N82-18275*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LARGE SPACE SYSTEMS TECHNOLOGY, 1981
William J. Boyer, comp. Mar. 1982 430 p refs Presented at Third Annual Technical Review, Hampton, Va., 16-19 Nov. 1981
(NASA-CP-2215-Pt-1; L-15096) Avail: NTIS HC A19/MF A01 CSCL 22B

A total systems approach including structures, analyses, controls, and antennas is presented as a cohesive, programmatic plan for large space systems. Specifically, program status, structures, materials, and analyses, and control of large space systems are addressed. For individual titles, see N82-18276 through N82-18304.

N82-18276*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Material Div.
THE EFFECTS OF ELECTRON AND GAMMA RADIATION ON EPOXY-BASED MATERIALS
R. E. Fornes, J. D. Memory, R. D. Gilbert, and E. R. Long, Jr. *In its* Large Space Systems Technol., 1981 Mar. 1982 p 27-36 Prepared in cooperation with North Carolina State Univ., Raleigh (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

Specimens of graphite/epoxy composites and epoxy resins were exposed to electron and gamma radiation, followed by mechanical property and fundamental measurements. Measurement techniques included: scanning electron microscopy, X-ray diffraction analysis, and electron spin resonance spectroscopic analysis. Results indicate little or no change in flexural properties of miniature specimens of a graphite/epoxy composite and no change in failure mode at the fiber-resin interface and in the crystallinity of the fiber and the resin. Some doubt in the observation of stable flexural properties is cast by electron paramagnetic resonance spectra of a relatively large number of radiation-generated radicals. These generally lead to a change in cross-linking and in chain-scissioning which should alter mechanical properties. J.M.S.

N82-18277*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BASIC PHYSICAL AND CHEMICAL PROCESSES IN SPACE RADIATION EFFECTS ON POLYMERS
E. Kamaratos, J. W. Wilson, C. K. Chang, and Y. J. Xu *In its* Large Space Systems Technol., 1981 Mar. 1982 p 37-58 refs Prepared in cooperation with Christopher Newport College and Old Dominion Univ. (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The effects of space ionizing radiation on polymers is investigated in terms of operative physical and chemical processes. A useful model of charged particle impact with a polymer was designed. Principle paths of molecular relaxation were identified and energy handling processes were considered. The focus of the study was on energy absorption and the immediately following events. Further study of the radiation degradation of polymers is suggested. M.D.K.

N82-18278*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Energy and Materials Research Section.
PULSED RADIOLYSIS OF MODEL AROMATIC POLYMERS AND EPOXY BASED MATRIX MATERIALS
Amitava Gupta, Jovan Moacanin, Ranty Liang, and Dan Coulter *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 59-65 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

Models of primary processes leading to deactivation of energy deposited by a pulse of high energy electrons were derived for epoxy matrix materials and poly[1-vinyl naphthalene]. The basic conclusion is that recombination of initially formed charged states is complete within 1 nanosecond, and subsequent degradation chemistry is controlled by the reactivity of these excited states. Excited states in both systems form complexes with ground state molecules. These excimers or exciplexes have their characteristics emissive and absorptive properties and may decay to form separated pairs of ground state molecules, cross over to the triplet manifold or emit fluorescence. ESR studies and chemical analyses subsequent to pulse radiolysis were performed in order to estimate bond cleavage probabilities and net reaction rates. The energy deactivation models which were proposed to interpret these data have led to the development of radiation stabilization criteria for these systems. Author

N82-18279*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECTS OF MICROCRACKING ON THE THERMAL EXPANSION OF GRAPHITE-EPOXY COMPOSITES
David E. Bowles *In its* Large Space Systems Technol., 1981 Mar. 1982 p 67-79 refs (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

A study of the effects of thermal environment and microcracking in graphite epoxy composites was made. Research indicates that microcracking does affect the thermal expansion of composite laminates. The amount of reduction in thermal expansion was a function of the crack density. A maximum reduction of approximately 25% occurred in a quasi-isotropic specimen with a crack density of 2.05 mm 1 in the 90 deg plies. Laminate analysis with appropriate reductions in E sub 2 and Alpha sub 2 of the damaged plies appears to be capable of modeling the observed M.D.K.

N82-18280*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THERMAL EXPANSION OF GRAPHITE-EPOXY BETWEEN 116 K AND 366 K
John S. Short, Michael W. Hyer, David E. Bowles, and Stephen S. Tompkins *In* is Large Space Systems Technol., 1981 Mar. 1982 p 81-92 ref Prepared in cooperation with Virginia Polytechnic Institute and State Univ. (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

A Priest laser interferometer was developed to measure the thermal strain of composite laminates. The salient features of this interferometer are that: (1) it operates between 116 K and 366 K; (2) it is easy to operate; (3) minimum specimen preparation is required; (4) coefficients of thermal expansion in the range of 0-5 micro epsilon/K can be measured; and (5) the resolution of thermal strain is on the order of micro epsilon. The thermal response of quasi-isotropic, T300/5208, grahite-epoxy composite material was studied with this interferometer. The study showed that: (1) for the material tested, thermal cycling effects are negligible; (2) variability of thermal response from specimen to specimen may become significant at cryogenic temperatures; and (3) the thermal response of 0.6 cm and 2.5 cm wide specimens are the same above room temperature. M.D.K.

N82-18281*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
FINITE ELEMENT THERMAL-STRUCTURAL MODELING OF ORBITING TRUSS STRUCTURES
Earl A. Thornton, Jack Mahaney, and Pramote Dechaumphai *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 93-108 refs (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

A description of an integrated finite element (FE) thermal-structural approach for accurate and efficient modeling of large space structures is presented. A geometric model with a common discretization for all analyses is employed. It uses improved thermal elements and the results from the thermal analysis directly in the structural analysis without any intervening data processing. The differences between the conventional FE approach as implemented in large programs and an integrated FE approach currently under development are described. Considerations for thermal modeling of truss members is discussed and three thermal truss finite elements are presented. The performance of these elements was evaluated for typical truss members neglecting joint effects. A simple truss with metallic joints and composite members was studied to evaluate the effectiveness of the approach for realistic truss designs. A study of the effects of aluminum joints on the thermal deformations of a simple, plane truss with composite members showed that joint effects may be significant. Further study is needed to assess the role of joint effects on the deformation of large trusses. M.D.K.

N82-18282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Structures and Dynamics Div.

VIBRATION AND BUCKLING STUDIES OF PRETENSIONED STRUCTURES **c75**

W. Keith Belvin *In its* Large Space Systems Technol., 1981 Mar. 1982 p 109-121 (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

Results of analyses and tests of a simple pretensional structure are presented. Linear finite element analysis correlated well with experimental small amplitude vibration data. The buckling and vibration behavior of a pretensional stayed column was studied in detail. The bifurcation buckling load was also predicted accurately. Postbuckling behavior of the column was unusual and results in a post buckling restoring force of only 1/64 the bifurcation buckling load. Interaction between lateral accelerations and compressive load creates isolated stay slackening at loads above 50 percent of the buckling load. Further research will be required to fully understand their impact on the use of pretensioned structures as large space structures. M.D.K.

N82-18283*# Idaho Univ., Moscow. Dept. of Engineering Science.

VIBRATION DAMPING CHARACTERISTICS OF GRAPHITE/EPOXY COMPOSITES FOR LARGE SPACE STRUCTURES

R. F. Gibson *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 123-132 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

Limited data on extensional and flexural damping of small specimens of graphite/epoxy and unreinforced epoxy resin were obtained. Flexural damping was measured using a forced vibration technique based on resonant flexural vibration of shaker excited double cantilever specimens. Extensional damping was measured by subjecting similar specimens to low frequency sinusoidal oscillation in a servohydraulic tensile testing machine while plotting load versus extensional strain. Damping was found to vary slowly and continuously over the frequency range 0.01 - 1000 Hz, and no drastic transitions were observed. Composite damping was found to be less than neat resin damping. Comparison of small specimen damping values with assembled column damping values seems to indicate that, for those materials, material damping is more important than joint damping. The data reported was limited not by the test apparatus, but by signal conditioning and data acquisition. It is believed that filtering of the strain gage signals and the use of digital storage with slow playback will make it possible to extend the frequency and amplitude ranges significantly. M.D.K.

N82-18284*# California Inst. of Tech., Pasadena. Div. of Engineering.

THE POTENTIAL OF NONPERIODIC TRUSS STRUCTURES FOR SPACE APPLICATIONS

K. C. Perk (Lockheed Palo Alto Research Lab.) and J. M. Winger *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 133-143 (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

In order to assess the dynamic characteristics of truss structures made of the nonperiodic lattices, a cantilever truss beam was analyzed for vibrations. In addition, three additional lattice configurations were also constructured along with two beams made of tetrahedrons. The relative frequency variations of the six cantilever truss beams for their first mode were examined. To make the comparison meaningful, the beam length, the number of lattice joints and the total weight were chosen to be identical within 2 percent differences. The frequencies of the four nonperiodic truss beams varied over 60 percent while those of the two beams of tetrahedron lattices only about 13 percent. Such wide frequency variations of the proposed nonperiodic truss beams indicate that the introduction of nonperiodic lattices could be effectively used to improve the controllability of steady state vibration as well as improved wave dispersion characteristics. T.M.

N82-18285*# Boeing Aerospace Co., Seattle, Wash.

IAC LEVEL 'O' PROGRAM DEVELOPMENT

R. G. Vos *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 145-157 (For primary document see N82-18275 09-15)

(Contract NAS5-25767)

Avail: NTIS HC A19/MF A01 CSCL 22B

The current status of the IAC development activity is summarized. The listed prototype software and documentation was delivered, and details were planned for development of the level 1 operational system. The planned end product IAC is required to support LSST design analysis and performance evaluation, with emphasis on the coupling of required technical disciplines. The long term IAC effectively provides two distinct features: a specific set of analysis modules (thermal, structural, controls, antenna radiation performance and instrument optical performance) that will function together with the IAC supporting software in an integrated and user friendly manner; and a general framework whereby new analysis modules can readily be incorporated into IAC or be allowed to communicate with it. T.M.

N82-18286*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

IAC CONTROL SYSTEM ANALYSIS DEVELOPMENT

Harold P. Frisch *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 159-167 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

The MultiOptimal Differential Equation Language (MODEL) is described. It provides a means for generating numerical solutions to systems of differential equations using a digital computer. The notation of this language is similar to that usually used in describing physical systems by differential equations. Thus, the learning process is simplified, programming becomes easier, and debugging is more readily accomplished. Programs written in the MultiOptimal Differential Equation Language are machine translated into FORTRAN 4 code which is optimal in several respects. The interactive version of MODEL makes use of interactive system routines so that the user may observe the solution as it is being generated and interact with the program in a manner similar to that associated with analog simulation. The DISCOS-Control version of the MODEL simulation language is used to describe the control system for a plant which is modelled by the DISCOS program. DISCOS plant variables may be referenced in the control system description and all the sensor signals, coupling torques, momentum devices and external loads are automatically linked to the DISCOS plant model. T.M.

N82-18287*# Martin Marietta Corp., Denver, Colo.

LARGE ADVANCED SPACE SYSTEMS (LASS) COMPUTER-AIDED DESIGN PROGRAM ADDITIONS

C. E. Farrell *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 169-177 (For primary document see N82-18275 09-15)

(Contract NAS1-1644)

Avail: NTIS HC A19/MF A01 CSCL 22B

The LSS preliminary and conceptual design requires extensive iteractive analysis because of the effects of structural, thermal, and control intercoupling. A computer aided design program that will permit integrating and interfacing of required large space system (LSS) analyses is discussed. The primary objective of this program is the implementation of modeling techniques and analysis algorithms that permit interactive design and tradeoff studies of LSS concepts. Eight software modules were added to the program. The existing rigid body controls module was modified to include solar pressure effects. The new model generator modules and appendage synthesizer module are integrated (interfaced) to permit interactive definition and generation of LSS concepts. The mass properties module permits interactive specification of discrete masses and their locations. The other modules permit interactive analysis of orbital transfer requirements, antenna primary beam n, and attitude control requirements. T.M.

N82-18288*# Astro Research Corp., Carpinteria, Calif.

SEQUENTIAL DEPLOYMENT OF TRUSS STRUCTURES

John M. Hedgebeth *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 179-192 (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

The geometry investigated most intensively was the triangular tetrahedral truss. A square type truss having the same topology was also investigated. The tetrahedral truss is composed of surface struts and core members. In the deployable form, the entire truss is viewed as being made up of a number of parallel truss ribs connected to each other by interrib struts and members. The packaging efficiency of the truss was evaluated. T.M.

N82-18289*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MOBILE WORK STATION CONCEPT FOR ASSEMBLY OF LARGE SPACE STRUCTURES (ZERO GRAVITY SIMULATION TESTS)
Walter L. Heard, Jr., Harold G. Bush, Richard E. Wallsom, and J. Kermit Jensen *In its* Large Space Systems Technol., 1981 Mar. 1982 p 193-204 refs Prepared in cooperation with Kentron International, Inc. (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The concept presented is intended to enhance astronaut assembly of truss structure that is either too large or complex to fold for efficient Shuttle delivery to orbit. The potential of augmented astronaut assembly is illustrated by applying the result of the tests to a barebones assembly of a truss structure. If this structure were assembled from the same nestable struts that were used in the Mobile Work Station assembly tests, the spacecraft would be 55 meters in diameter and consist of about 500 struts. The struts could be packaged in less than 1/2% of the Shuttle cargo bay volume and would take up approximately 3% of the mass lift capability. They could be assembled in approximately four hours. This assembly concept for erectable structures is not only feasible, but could be used to significant economic advantage by permitting the superior packaging feature of erectable structures to be exploited and thereby reduce expensive Shuttle delivery flights. T.M.

N82-18290*# Grumman Aerospace Corp., Bethpage, N.Y.
ORBITER BASED CONSTRUCTION EQUIPMENT
C. J. Goodwin *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 205-217 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

Many orbiter based activities need equipment to hold a payload steady while it is being worked on. This work may be construction, updating, repair, services, check out, or refuerling operations in preparation for return to Earth. The Handling and Positioning Aid (HPA) is intended for use as general purpose equipment. The HPA provides a wide choice of work station positions, both immediately above the orbiter cargo bay and beyond. It can act in a primary docking role and, if required, can assist actively in the berthing process. From an analysis of ten reference missions, it was determined that two types of HPA mobility are needed; a tilt table, which simply swings out of the cargo bay, pivoting about an athwartships y axis, and an articulated arm. Illustration of the aid are provided. T.M.

N82-18291*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DEPLOYABLE PLATFORM SYSTEMS DEVELOPMENT
R. E. Jewell *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 219-233 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The long range objective is to achieve technology readiness for one or more deployable platform systems by 1986. Engineering plans and approaches to meet this goal are presented in outline form. L.F.M.

N82-18292*# Martin Marietta Corp., Denver, Colo.
TECHNOLOGICAL NEEDS OF ADVANCED EARTH-OBSERVATION SPACECRAFT
A. L. Brook *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 235-240 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

An outline of the type of Earth observations needed is presented. The characteristics of a 120 meter by 60 meter microwave radiometer are discussed along with those of supplementary instruments. L.F.M.

N82-18293*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LSS CONTROL TECHNOLOGY
A. F. Tolivar *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 241-247 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

Control for Large Space Systems is discussed. Emphasis is placed on platform control and antenna control. L.F.M.

N82-18294*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL OF LARGE SPACE ANTENNAS: WRAP-RIB-HOOP/COLUMN
Yu-Hwan Lin *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 249-281 refs (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

Control work for large space antenna systems is discussed. Included are the wrap-rib and hoop/column antenna concepts for communications and radiometry. L.F.M.

N82-18295*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPATIAL, HIGH-ACCURACY, POSITIONING-ENCODING SENSOR (SHAPES) FOR LARGE SPACE SYSTEM CONTROL APPLICATIONS
J. M. McLauchlan *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 283-296 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The Spatial, High-Accuracy, Position-Encoding Sensor is a controls sensor suitable for the determination of the static shape and vibrational motion of large space structures and similar systems and for the determination of position and velocity in rendezvous and docking. It uses a combination of electro-optical techniques to measure the three-dimensional coordinates distributed over the structure at reading rates high compared to the rates at which the coordinates are changing. The technical approach is that of measuring the distance to and the direction of points on the structure from a single sensor head. Many points can be measured simultaneously from a single head without significantly increasing the complexity of the system. L.F.M.

N82-18296*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONTROL TECHNOLOGY DEVELOPMENT
David B. Schaechter *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 297-311 refs (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The main objectives of the control technology development task are given in the slide below. The first is to develop control design techniques based on flexible structural models, rather than simple rigid-body models. Since large space structures are distributed parameter systems, a new degree of freedom, that of sensor/actuator placement, may be exercised for improving control system performance. Another characteristic of large space structures is numerous oscillatory modes within the control bandwidth. Reduced-order controller design models must be developed which produce stable closed-loop systems when combined with the full-order system. Since the date of an actual large-space-structure flight is rapidly approaching, it is vitally important that theoretical developments are tested in actual hardware. Experimental verification is a vital counterpart of all current theoretical developments. L.F.M.

N82-18297*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LSS REFERENCE PLATFORM CONTROL
Rance S. Edmunds *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 313-333 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

The long range objective of this task is to develop basic

technology in the design, mechanization, and analysis of control systems for large flexible space structures. The focus of the FY'81 platform control effort was on the pointing control problems associated with multiple independently controlled experiment packages operating simultaneously on a single platform. Particular emphasis was placed on obtaining a quantitative comparison of controller performance with and without base motion compensation. L.F.M.

N82-18298*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A STUDY OF AUTONOMOUS RENDEZVOUS AND DOCKING SYSTEMS

J. D. Michael *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 335-344 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

An overview of activities in the automatic rendezvous and docking area is presented. A representative mission scenario is covered. A statement of the problem is made and the requirements for the extraction of relative attitude and position data are delineated. A systems block diagram is included and the integral functions which go to make up an autonomous docking system is described. A system was simulated, and the digital simulation is described along with some representative results of a system based a laser ranging device as the sensor. A television camera as the ranging sensor was also considered, one video based automatic docking scheme is discussed along with some representative results. S.L.

N82-18299*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A DISTURBANCE ISOLATION CONTROLLER FOR THE SOLAR ELECTRIC PROPULSION SYSTEM FLIGHT EXPERIMENT

H. B. Waites *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 345-361 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

A disturbance isolation controller (DIC) is developed for a simplified model of the solar electric propulsion system (SEPS) flight experiment which consists of a rigid Sperry gimbal torquer (AGS) mounted to a rigid orbiter and the SEPS solar array (rigid) end mounted to the AGS. The main purpose of the DIC is to reduce the effects of orbiter disturbances which are transmitted to the flight experiment. The DIC uses an observer, which does not require the direct measurement of the plant inputs, to obtain estimates of the plant states and the rate of the plant states. The state and rate of state information is used to design a controller which isolates disturbances from specified segments of the plant, and for the flight experiment, the isolated segment is the SEPS solar array. S.L.

N82-18300*# Bendix Corp., Teterboro, N. J. Test Systems Div.

MODULAR ATTITUDE CONTROL OF A LARGE SPACE PLATFORM

F. D. Chichester *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 363-370 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

The modular attitude control of a large space platform is studied using a three axis five body model of a flexible spacecraft. Three degree of freedom hinges are considered. A three axis four body model of a truss and a three axis ten body model of a space platform are presented. A state variable rotational dynamics model and a multilevel state variable model are shown. A decomposed performance index and decomposed Hamiltonian are also presented. A subproblem hierarchy for hybrid multilevel LQR attitude control of a three axis model is described. S.L.

N82-18301*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SYSTEMS IDENTIFICATION TECHNOLOGY DEVELOPMENT FOR LARGE SPACE SYSTEMS

E. S. Armstrong *In its* Large Space Systems Technol., 1981 Mar. 1982 p 371-374 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

A methodology for synthesizing systems identification, both parameter and state, estimation and related control schemes for flexible aerospace structures is developed with emphasis on the Maypole hoop column antenna as a real world application. Modeling studies of the Maypole cable hoop membrane type antenna are conducted using a transfer matrix numerical analysis approach. This methodology was chosen as particularly well suited for handling a large number of antenna configurations of a generic type. A dedicated transfer matrix analysis, both by virtue of its specialization and the inherently easy compartmentalization of the formulation and numerical procedures, is significantly more efficient not only in computer time required but, more importantly, in the time needed to review and interpret the results. S.L.

N82-18302*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CONFIGURATIONAL AND SYSTEM REQUIREMENTS FOR CONTROL OF LARGE SPACE SYSTEMS

L. W. Taylor, Jr. *In its* Large Space Systems Technol., 1981 Mar. 1982 p 375-388 (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

Control of large space systems, modeling, and control difficulties are discussed. Ground based analysis of spaceflight data are presented to determine structural dynamics characteristics for the purpose of revising control laws, and to trim the surface contour. Systems identification for adaptive control and automatic surface control are also considered. S.L.

N82-18303*# Honeywell Systems and Research Center, Minneapolis, Minn.

INTEGRATED CONTROLS/STRUCTURES STUDY OF ADVANCED SPACE SYSTEMS

C. S. Greene and T. B. Cunningham *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 389-412 refs (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

A cost tradeoff is postulated for a stiff structure utilizing minimal controls (and control expense) to point and stabilize the vehicle. Extra costs for a stiff structure are caused by weight, packaging size, etc. Likewise, a more flexible vehicle should result in reduced structural costs but increased costs associated with additional control hardware and data processing required for vibration control of the structure. This tradeoff occurs as the ratio of the control bandwidth required for the mission to the lowest (significant) bending mode of the vehicle. The cost of controlling a spacecraft for a specific mission and the same basic configuration but varying the flexibility is established. S.L.

N82-18304*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

ACTIVE CONTROL OF SPACE STRUCTURES: PROOF OF CONCEPT EXPERIMENT

J. A. Breakwell *In* NASA. Langley Research Center Large Space Systems Technol., 1981 Mar. 1982 p 413-428 (For primary document see N82-18275 09-15)

Avail: NTIS HC A19/MF A01 CSCL 22B

Modern control theory easily works with multiple input/multiple output systems. Two types of systems which fall into this category are flexible systems, where many measurements and several actuators are necessary to provide control over bending behavior, and articulated systems which consist of several rigid bodies connected together by pivoting connections. In this latter case, multiple controls are implemented as torquers at the joints. S.L.

N82-18305# Office of Technology Assessment, Washington, D. C.

SOLAR POWER SATELLITES, SUMMARY

Aug. 1981 22 p

(OTA-E-145) Avail: NTIS HC A02/MF A01

The energy potential of the solar power satellite (SPS) was assessed. The preliminary nature of SPS technology was taken into account by comparing four alternative SPS systems across a broad range of issues: their technical characteristics long term energy supply potential, international and military implications,

environmental impacts, and institutional effects. The SPS options were also compared to potentially competitive energy technologies in order to identify how choices among them might be made. In addition, a set of Federal research and funding options were developed to address the central questions and uncertainties identified in the report. S.L.

N82-18306# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TONE RECEIVER FOR SATELLITE POSITION DETERMINATION [RECEPTOR DE TONS PARA LOCALIZACAO DE SATELLITES]
Celso Macedo deAndrade and Aydano B. Carleial Jul. 1981 19 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981
(INPE-2159-RPE/378) Avail: NTIS HC A02/MF A01

The receiver has the function of processing the ranging signal, composed of tones in 40, 160, 800, 4000, and 20000 Hz, according to the NASA standard. This signal originates on the ground and is retransmitted back by the satellite. The processing consists of separating the tones, which jointly modulate the carrier, and comparing their phases with the phases of the corresponding original tones, transmitted from the ground. Tone separation is accomplished by second-order PLLs, which operate as narrowband filters. From each phase comparison results a signal with pulses modulated in width by the phase difference between the two waves in question. The five measured values are forwarded by the receiver to another apparatus, which computes the distance from these data. T.M.

N82-18307# Alabama Univ. in Huntsville. School of Science and Engineering.
IMPLEMENTATION OF AN OVERLAID VERSION OF P2 SIMULATION
Steven Mann and David Cobb Redstone Arsenal, Ala. Army Missile Command Jul. 1981 19 p
(Contract DAAH01-81-D-A006)
(AD-A108592; DRSMI/RD-81-18-TR) Avail: NTIS HC A02/MF A01 CSCL 16/2

The techniques for implementing a very large PERSHING II digital simulation on a Perkin Elmer minicomputer are discussed in this report. The simulation was broken into subunits and overlaid. A summary is given on the software requirements for operating the simulation. Author (GRA)

N82-18308# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
STATUS REPORT ON THE AERONAUTICAL RESEARCH INSTITUTE OF SWEDEN VERSION OF THE MISSILE AERODYNAMICS PROGRAM LARV, FOR CALCULATION OF STATIC AERODYNAMIC PROPERTIES AND LONGITUDINAL AERODYNAMIC DAMPING DERIVATIVES. PART 1: THEORY
Erling Weibust 1981 169 p refs
(Contract F-K-80123-80-004-21-001)
(FFA-TN-AU-1661-Pt-1) Avail: NTIS HC A08/MF A01

Improvements to a missile aerodynamics program which enable it to (a) calculate aerodynamic coefficients as input for a flight mechanics model, (b) check manufacturers' data or estimate performance from photographs, (c) reduce wind tunnel testing, and (d) aid optimization studies, are discussed. Slender body theory is used for longitudinal damping derivatives prediction. Program predictions were compared to known values. Greater accuracy is required in the estimation of drag due to excrescences on actual missile configurations, the influence of a burning motor, and nonlinear effects in the stall region. Prediction of pressure centers on wings and on bodies in presence of wings must be improved. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-18309*# Boeing Co., Seattle, Wash.
SURVEY OF MULTI-FUNCTION DISPLAY AND CONTROL TECHNOLOGY
R. J. Spiger, R. J. Farrell, and M. H. Tonkin [1982] 79 p refs
(Contract NAS9-16445)
(NASA-CR-167510; D180-26864-1) Avail: NTIS HC A05/MF A01 CSCL 22B

The NASA orbiter spacecraft incorporates a complex array of systems, displays and controls. The incorporation of discrete dedicated controls into a multi-function display and control system (MFDCS) offers the potential for savings in weight, power, panel space and crew training time. The technology applicable to the development of a MFDCS for orbiter application is surveyed. Technology thought to be applicable presently or in the next five years is highlighted. Areas discussed include display media, data handling and processing, controls and operator interactions and the human factors considerations which are involved in a MFDCS design. Several examples of applicable MFDCS technology are described. T.M.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-18310*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
A DYNAMIC MEASURE OF CONTROLLABILITY AND OBSERVABILITY FOR THE PLACEMENT OF ACTUATORS AND SENSORS ON LARGE SPACE STRUCTURES
Wallace E. VanderVelde and Craig R. Carignan Jan. 1982 55 p refs
(Grant NAG1-126)
(NASA-CR-168520; SSL-2-82) Avail: NTIS HC A04/MF A01 CSCL 22B

The degree of controllability of a large space structure is found by a four step procedure: (1) finding the minimum control energy for driving the system from a given initial state to the origin in the prescribed time; (2) finding the region of initial state which can be driven to the origin with constrained control energy and time using optimal control strategy; (3) scaling the axes so that a unit displacement in every direction is equally important to control; and (4) finding the linear measurement of the weighted 'volume' of the ellipsoid in the equicontrol space. For observability, the error covariance must be reduced toward zero using measurements optimally, and the criterion must be standardized by the magnitude of tolerable errors. The results obtained using these methods are applied to the vibration modes of a free-free beam. A.R.H.

N82-18311*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN PRACTICES FOR CONTROLLING SPACECRAFT

CHARGING INTERACTIONS
N. John Stevens 1982 21 p refs Presented at the 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan. 1982; sponsored by AIAA
(NASA-TM-82781; E-1112) Avail: NTIS HC A02/MF A01 CSCL 22B

A design guidelines handbook prepared to provide criteria for assessing and minimizing spacecraft charging interactions is described. An evaluation philosophy of analyzing specific satellite designs in a substorm environment specification with NASCAP is proposed. Criteria for possible discharges are given and a technique for computing the discharge transients is outlined. The charging of a three axis stabilized satellite is examined to illustrate the philosophy. Possible discharge locations are found and transients computed. The effect of changing selected surface coatings is evaluated and found to substantially reduce charging levels. J.M.S.

N82-18312*# Essex Corp., Alexandria, Va.
THE DESIGN, FABRICATION AND INSTALLATION OF CABLE ROUTING MOCKUPS IN SUPPORT OF SPACELAB 2 Final Report
23 Dec. 1981 6 p
(Contract NAS8-34127)
(NASA-CR-161975; H-81-06) Avail: NTIS HC A02/MF A01 CSCL 22B

From flight and mockup drawings of Spacelab 2 (SL 2) experiments and hardware, shop ready mockup drawings were produced. Floor panels were the first items considered for fabrication. Cold plate and orthogrid mockups were designed and fabricated. Experiment and other hardware mockups were fabricated of aluminum or plywood, depending on size and configuration. Eighty-three cable routing bracket mockups were fabricated of aluminum and delivered for painting. N.W.

N82-18313# TRW Defense and Space Systems Group, Redondo Beach, Calif.
ACOSS EIGHT (ACTIVE CONTROL OF SPACE STRUCTURES), PHASE 2 Final Technical Report, May 1980 - Apr. 1981
Ralph P. Iwens, Robert J. Benhabib, and Frank C. Tung Griffiss AFB, N.Y. RADC Sep. 1981 184 p refs
(Contracts F30602-80-C-0198; AF Proj. C654; ARPA Order 3654)
(AD-A108629; TRW-36296-6001-UT-00-PH-2; RADC-TR-81-242) Avail: NTIS HC A09/MF A01 CSCL 13/1

This effort addresses three areas of active structure control/vibration control: (1) Stability ensuring designs in the presence of modal truncation/inaccurate structural models using a method based on the positivity of operators; (2) On-orbit parameter identification using the maximum likelihood method; and (3) Trade-offs between model reference adaptive control and fixed gain control with and without on-orbit parameter identification and system tuning, developed a stability ensuring design methodology which does not rely on modal truncation, has only low sensitivity to the exact knowledge of the structures model and, with some modifications, can be extended to non-linear systems. The method yields good performance, but is not necessarily optimal. The maximum likelihood method of parameter identification was studied. Parameter data collected on-orbit could be used to up-date the control model and improve performance. An alternative to explicit parameter identification and subsequent system tuning is direct adaptive control. Trade-offs between parameter identification and tuning versus adaptive controls were coordinated and the results are presented. Author (GRA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-18314* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW THRUST MONOPROPELLANT ENGINE Patent
John D. Kuenzly, inventor (to NASA) (TRW, Inc., Redondo Beach, Calif.) Issued 15 Sep. 1981 5 p Filed 20 Dec. 1978 Supersedes N79-15151 (17 - 06, p 0707) Continuation of abandoned US Patent Appl. SN-819029, filed 25 Jul. 1977 Sponsored by NASA
(NASA-Case-GSC-12194-2; US-Patent-4,288,982; US-Patent-Appl-SN-971474; US-Patent-Appl-SN-819029; US-Patent-Class-60-200R; US-Patent-Class-60-39.46M) Avail: NTIS Avail: US Patent and Trademark Office CSCL 21H

The engine has a conventional body and nozzle configuration. The monopropellant fuel is fed into the thruster with dual injection tubes via an injector shell with dual spray jets. The spray jets are positioned generally opposed to each other. A heater screen pack combination thermally decomposes the fuel after injection into the combustion chamber of the thruster. NASA

N82-18315*# Martin Marietta Aerospace, Denver, Colo.
PRIMARY PROPULSION/LARGE SPACE SYSTEM INTERACTION STUDY Final Report, Sep. 1979 - Dec. 1980
J. V. Coyner, R. H. Dergance, R. I. Robertson, and J. V. Wiggins Dec. 1981 358 p refs
(Contract NAS3-21955)
(NASA-CR-165277; MCR81-504) Avail: NTIS HC A16/MF A01 CSCL 21H

An interaction study was conducted between propulsion systems and large space structures to determine the effect of low thrust primary propulsion system characteristics on the mass, area, and orbit transfer characteristics of large space systems (LSS). The LSS which were considered would be deployed from the space shuttle orbiter bay in low Earth orbit, then transferred to geosynchronous equatorial orbit by their own propulsion systems. The types of structures studied were the expandable box truss, hoop and column, and wrap radial rib each with various surface mesh densities. The impact of the acceleration forces on system sizing was determined and the effects of single point, multipoint, and transient thrust applications were examined. Orbit transfer strategies were analyzed to determine the required velocity increment, burn time, trip time, and payload capability over a range of final acceleration levels. Variables considered were number of perigee burns, delivered specific impulse, and constant thrust and constant acceleration modes of propulsion. Propulsion stages were sized for four propellant combinations; oxygen/hydrogen, oxygen/methane, oxygen/kerosene, and nitrogen tetroxide/monomethylhydrazine, for pump fed and pressure fed engine systems. Two types of tankage configurations were evaluated, minimum length to maximize available payload volume and maximum performance to maximize available payload mass. S.L.

N82-18316*# Lockheed Missiles and Space Co., Huntsville, Ala. Advanced Fluid Mechanics Section.
IMPROVEMENT OF ROCKET ENGINE PLUME ANALYSIS TECHNIQUES Final Report
Sheldon D. Smith Jan. 1982 85 p refs
(Contract NAS9-16256)
(NASA-CR-167516; LMSC-HREC-TR-D784753) Avail: NTIS HC A05/MF A01 CSCL 21H

A nozzle plume flow field code was developed. The RAMP code which was chosen as the basic code is of modular construction and has the following capabilities: two phase with two phase transonic solution; a two phase, reacting gas (chemical equilibrium reaction kinetics), supersonic inviscid nozzle/plume solution; and is operational for inviscid solutions at both high and low altitudes. The following capabilities were added to the code: a direct interface with JANNAF SPF code; shock capturing

finite difference numerical operator; two phase, equilibrium/frozen, boundary layer analysis; a variable oxidizer to fuel ratio transonic solution; an improved two phase transonic solution; and a two phase real gas semiempirical nozzle boundary layer expansion.
S.L.

N82-18317# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.
EXACT INVOLUTE BODIES OF REVOLUTION Interim Technical Report, Jun. 1979 - Jun. 1980
Nicholas J. Pagano May 1981 53 p refs
(AF Proj. 2419)
(AD-A108659; AFWAL-TR-80-4152) Avail: NTIS HC A04/MF A01 CSCL 21/3

Involute construction is an approach used in contemporary rocket nozzle technology for the fabrication of exit cones and other bodies of revolution and consists of laminating identical composites sheets of uniform thickness along curved surfaces, called involute surfaces. In this work, we shall derive the exact solution for these surfaces, which guarantees that the volume of the body being generated is precisely filled, with no gaps or overlaps. We also present the equations of the developed surface, or ply pattern, a formulation of the kinematics of the fabrication debulking process, and an experimental validation of the theoretical work.
GRA

N82-18318# Thiokol Corp., Huntsville, Ala.
ADVANCED AIR LAUNCHED MISSILE MOTOR DESIGNED METHODS Final Report, 21 Jan. 1980 - 4 Sep. 1981
G. P. Roys Sep. 1981 46 p refs
(Contract F04611-80-C-0016; AF Proj. 3148)
(AD-A108634; U-81-17A) Avail: NTIS HC A03/MF A01 CSCL 21/8

This report is the final report of a three-phase project whose objective was to formulate a computer code to perform detailed preliminary designs of solid propellant rocket motors. All major components and performance of a motor are mathematically modeled using source dimensions and characteristics. A direct pattern search non-linear optimization scheme based on the Hooke and Jeeves algorithm is employed to establish motor characteristics that optimize any one of several performance parameters. Constraints imposed during the optimization process are basic performance requirements, design constraints and operating limits. Decision variables during optimization are propellant formulation, propellant burn rate, propellant grain dimensions, nozzle dimensions, and pressure vessel dimensions. Provisions are made for easily inserted user-defined models of several characteristics.
Author (GRA)

N82-18319# Thiokol Corp., Huntsville, Ala.
USER'S MANUAL FOR SOLID PROPULSION OPTIMIZATION CODE (SPOC). VOLUME 1: TECHNICAL DESCRIPTION Progress Report, 28 Mar. 1980 - 21 Aug. 1981
G. P. Roys Aug. 1981 244 p refs 3 Vol.
(Contract F04611-80-C-0016; AF Proj. 3148)
(AD-A108224; U-81-4457A; AFRPL-TR-81-70-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 21/8

A user's manual for a computer code that performs detailed preliminary designs of solid propellant rocket motors is presented. All major components and performance of a motor are mathematically determined using source dimensions and characteristics. A direct pattern search nonlinear optimization scheme based on the Hooke and Jeeves algorithm is employed to establish motor characteristics that optimize any one of several performance parameters. Decision variables during optimization are propellant formulation, propellant burn rate, propellant grain dimensions, nozzle dimensions, and pressure vessel dimensions. Provisions are made for easily inserted user defined models of several characteristics. Constraints imposed during the optimization process are performance requirements, design constraints, and operating limits.
Author

N82-18320# Thiokol Corp., Huntsville, Ala.
USER'S MANUAL FOR SOLID PROPULSION OPTIMIZATION CODE (SPOC). VOLUME 2: USER'S GUIDE Special Report, Feb. 1980 - Aug. 1981
G. P. Roys Aug. 1981 211 p 3 Vol.
(Contract F04611-80-C-0016; AF Proj. 3148)
(AD-A108225; U-81-4457B; AFRPL-TR-81-70-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 21/8

The input and output dictionaries and their accompanying illustrations are presented along with other input instructions that are needed to execute the code. The user supplies a starting condition - an initial design - and all associated information needed to evaluate that design. These data are read in through a series of input namelists. The initial design is evaluated in the executive subroutine COMP and the results are printed. Then the print control is turned off and optimizer routine (PATSH) is called, which in turn makes multiple calls to COMP to evaluate the design with PATSH generated changes in values of user-specified parameters. Once an optimized design is reached, the print control is turned on and a final pass through COMP gives a complete description of the final design. The analyses performed in SPOC are: (1) grain geometric validation, (2) nozzle geometric validation, and (3) propellant thermochemistry.
S.L.

N82-18321# Thiokol Corp., Huntsville, Ala.
USER'S MANUAL FOR SOLID PROPULSION OPTIMIZATION CODE (SPOC). VOLUME 3: PROGRAM DESCRIPTION Special Report, Feb. 1980 - Aug. 1981
G. P. Roys Aug. 1981 28 p
(Contract F04611-80-C-0016; AF Proj. 3148)
(AD-A108226; U-81-4457C; AFRPL-TR-81-70-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 21/8

The solid propulsion optimization code performs detailed preliminary designs of a large variety of solid propellant rocket motors. Dimensions of the propellant grain, nozzle, and pressure vessel are adjusted by the code, along with propellant formulation and burn rate, to produce a motor design that satisfies performance requirements and design constraints, and that has been optimized with respect to a user selected parameter. The subroutine descriptions and flow charts are presented. Cross-indices of common statements, subroutines and call statements are also included.
Author

N82-18322# European Space Agency, Paris (France).
THEORETICAL CONSIDERATIONS OF BORON COMBUSTION IN DUCTED ROCKETS
Dirk Meinkoehn and Juergen Bergmann Oct. 1981 55 p refs Transl. into ENGLISH from "Theoretische Ueberlegungen zur Borverbrennung im Kombinationsantrieben", Rept. DFVLR-FB-80-26 DFVLR Hardthausen am Kocker, West Germany, 1980
(ESA-TT-703; DFVLR-FB-80-26) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 15,10

The use of elemental boron as a fuel component for a ducted rocket motor design, consisting of a primary gas generator and an air breathing secondary chamber for the afterburning of the boron-rich exhaust from the primary chamber, is investigated. The primary chamber is conceived as a hybrid gas generator with nitric acid as the oxidizer and a solid fuel containing a high percentage of elemental boron. This design concept is characterized by the inherent advantage of a possible thrust modulation via the control of the oxidizer flow. The investigation shows that boron combustion ignition and satisfactory combustion efficiency require high gas temperatures. This can be achieved by primary combustion of a fraction of the total boron fuel.
Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-18323# Florida Univ., Gainesville. Dept. of Chemistry.
STUDIES RELATING TO THE SYNTHESIS OF MONOMETHYLHYDRAZINE BY CHLORAMINATION AND PROBLEM RELATING TO THE PROTECTION OF THE ENVIRONMENT FROM THE VAPORS OF 1, 1-DIMETHYLHYDRAZINE, MONOMETHYLHYDRAZINE AND HYDRAZINE Final Report, 1 Oct. 1979 - 30 Jun. 1981
Harry H. Sisler and Milap A. Mathur 30 Sep. 1981 8 p
(Grant AF-AFOSR-0007-80; AF Proj. 2303)

(AD-A108369; AFOSR-81-0769TR) Avail: NTIS HC A02/MF A01 CSCL 07/3.

The synthesis of monomethylhydrazine was successfully achieved by reacting solutions of hydroxylamine-O-sulfonic acid with methylamine in diglyme. The synthesis of 1,1-dimethylhydrazine was carried out in a similar manner with dimethylhydrazine. A mechanism for the formation of formaldehyde dimethylhydrazone by the reaction of dimethylamine and chloramine was proposed. A study was conducted on the oxidation of monomethylhydrazine and 1,1-dimethylhydrazine by oxygen.

Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N82-18324 Pennsylvania State Univ., University Park.
DYNAMIC MECHANICAL PROPERTIES OF SOME WOOD-POLYMER COMPOSITE MATERIALS Ph.D. Thesis
Gregory Richard Moore 1981 109 p
Avail: Univ. Microfilms Order No. 8129191

A method was developed for impregnating small specimens of whole wood and some reconstituted wood products with undiluted bisphenol A-based epoxy resin containing a curing agent. This process was used to impregnate yellow-poplar (Liriodendron tulipifera L.) sapwood and untempered dry-process hardboard. A detailed analysis of the dynamic mechanical properties of these impregnated materials was made for the temperature range from 0 through 100 C. The composition and mechanical properties of the impregnant were varied by changing the concentration of the metaphenylenediamine curing agent. This influenced the properties of the composite, particularly the internal friction. In all cases examined, the rule of mixtures resulted in high estimates for the internal friction and low estimates for the apparent dynamic modulus. A modified form of the rule of mixtures, which accounted for estimated strain energy sharing effects, produced better agreement between the observed and predicted internal friction results for the impregnated samples. Dissert. Abstr.

N82-18325*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN ASSESSMENT OF BUFFER STRIPS FOR IMPROVING DAMAGE TOLERANCE OF COMPOSITE LAMINATES AT ELEVATED TEMPERATURE
C. A. Bigelow Dec. 1981 14 p ref
(NASA-TM-83257) Avail: NTIS HC A02/MF A01 CSCL 11D

Buffer strips greatly improve the damage tolerance of graphite/epoxy laminates loaded in tension. Graphite/polyimide buffer strip panels were made and tested to determine their residual strength at ambient and elevated (177 C) temperature. Each panel was cut in the center to represent damage. Panels were radiographed and crack-opening displacements were recorded to indicate fracture, fracture arrest, and the extent of damage in the buffer strip after arrest. All panels had the same buffer strip spacing and width. The buffer strip material was 0 deg S-glass/PMR-15. The buffer strips were made by replacing narrow strips of the 0 deg graphite plies with strips of the 0 deg S-glass on either a one-for-one or a two-for-one basis. Half of the panels were heated to 177 + or - 3 C before and during the testing. Elevated temperature did not alter the fracture behavior of the buffer configuration. J.M.S.

N82-18326*# Wyoming Univ., Laramie. Composite Materials Research Group.
MICROMECHANICAL PREDICTIONS OF CRACK PROPAGATION AND FRACTURE ENERGY IN A SINGLE FIBER BORON/ALUMINUM MODEL COMPOSITE
Donald F. Adams and Jayant M. Mahishi Feb. 1982 65 p refs
(Grant NsG-3217)
(NASA-CR-168550; UWME-DR-201-101-1) Avail: NTIS HC A04/MF A01 CSCL 11D

The axisymmetric finite element model and associated computer program developed for the analysis of crack propagation in a composite consisting of a single broken fiber in an annular sheath of matrix material was extended to include a constant displacement boundary condition during an increment of crack propagation. The constant displacement condition permits the growth of a stable crack, as opposed to the catastropic failure in an earlier version. The finite element model was refined to respond more accurately to the high stresses and steep stress gradients near the broken fiber end. The accuracy and effectiveness of the conventional constant strain axisymmetric element for crack problems was established by solving the classical problem of a penny-shaped crack in a thick cylindrical rod under axial tension. The stress intensity factors predicted by the present finite element model are compared with existing continuum results. S.L.

N82-18327*# Boeing Commercial Airplane Co., Seattle, Wash.
A STUDY OF THE EFFECTS OF LONG-TERM EXPOSURE TO FUELS AND FLUIDS ON THE BEHAVIOR OF ADVANCED COMPOSITE MATERIALS Final Report
E. Y. Tanimoto Aug. 1981 40 p ref
(Contract NAS1-12428)
(NASA-CR-165763; D6-41185-9) Avail: NTIS HC A03/MF A01 CSCL 11D

The periodic testing and evaluation of graphite/epoxy and Kevlar/epoxy material systems after subjecting test specimens to prolonged exposure to several laboratory-controlled environments deemed typical of normal aircraft operations is discussed. It is noted that specimen immersion in water or water-based fluids resulted in the greatest effect on the mechanical properties tested. Also, the environmental fluids showed a tendency to affect Kevlar/epoxy systems at an earlier exposure period than the graphite/epoxy systems. Results also indicate mechanical property strength retention generally being lower for the Kevlar/epoxy systems when compared to the corresponding graphite/epoxy systems in similar environments, after prolonged exposure. B.W.

N82-18328# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.
MITIGATION OF CONDUCTIVE FIBER RELEASE BY SELECTED COATINGS Final Report
Stanley E. Wentworth and Abram O. King Sep. 1981 14 p refs
(DA Proj. 1L1-62105-AH-84)
(AD-A108270; AMMRC-TR-81-47) Avail: NTIS HC A02/MF A01 CSCL 07/4

Several polymeric coatings have been evaluated, by means of a technique utilizing thermogravimetric analysis and scanning electron microscopy, as to their effectiveness in preventing the release of conductive fibers from a graphite/epoxy composite subjected to a thermaloxidative environment. The coatings examined included a conventional commercial paint, a conventional Mil Spec flame-retardant paint, an experimental poly (aryloxyphosphazene)-based flame-retardant paint, and an experimental high temperature-resistant polyphenylquinoxaline (PPQ). It was concluded that the PPQ offered considerable promise for mitigating fiber release although work on formulation development is required for optimum effect. It was also concluded that the poly(aryloxyphosphazene) coated directly onto the fibers prior to their incorporation into the composite was an equally promising approach provided that the resultant degradation in mechanical properties can be circumvented. GRA

N82-18329# Ashland Chemical Co., Columbus, Ohio.
IMPROVED GRAPHITE FIBER ADHESION Final Technical Report, 10 Sep. 1979 - 11 Jun. 1981
G. Gynn, R. N. King, S. F. Chappell, and M. L. Deviney Wright-Patterson AFB, Ohio AFWAL Sep. 1981 122 p refs
(Contract F33615-79-C-5060; AF Proj. 2419)
(AD-A108233; AFWAL-TR-81-4096) Avail: NTIS HC A06/MF A01 CSCL 11/4

Several different commercial graphite fibers were characterized as to surface chemistry by XPS analysis, radiotracer analysis, thermal desorption/mass spectrometry, and surface energetics via contact angle measurements. These fibers were then treated by selective oxidation and devolatilization. Various interphase resins were then electrodeposited on the fibers. Composites were made from three matrix resins using the electrodeposited fibers and tested before and after exposure to

moisture aging. No improvement in shear strength due to the electrodeposited interphase resins was noted. Author (GRA)

N82-18330# Universal Energy Systems, Inc., Dayton, Ohio.
A DIGITAL ALGORITHM FOR COMPOSITE LAMINATE ANALYSIS, FORTRAN Final Report, 3 Jul. 1980 - 1 Jun. 1981
Som R. Soni Wright-Patterson AFB, Ohio AFWAL Sep. 1981 86 p refs
(Contract F33615-79-C-5129)
(AD-A108201; AFWAL-TR-81-4073) Avail: NTIS HC A05/MF A01 CSCL 11/4

A FORTRAN computer code for the solution of composite materials problems is presented. The computer program can conduct the point stress analysis of general laminates and hybrid laminates. The effect of hygrothermal and mechanical loads on the strength of composite laminates can be studied. Analytical formulas based on the lamination theory were used. Input and output parameters are explained in detail. The algorithm is written in an easily understandable format. At the most, the program can take care of eight materials and twenty plys. For problems containing more materials and plys, the corresponding dimensions are to be increased in the main program and related subroutines. Required material properties can be used by giving a corresponding material property identification number in the layers data card. These quantities are given in SI units. If the results are desired in English units (i.e., Psi, etc.), a unit identification number not equal to 1(-2), has to be used. GRA

N82-18331# Cambridge Univ. (England). Dept. of Engineering.
THE CONSTRUCTION AND USE OF TOUGHNESS MAPS IN A FRACTURE ANALYSIS OF THE MICROMECHANICS OF A COMPOSITE FAILURE
J. K. Wells and P. W. R. Beaumont Feb. 1981 30 p refs
(Grant AF-AFOSR-3644-78)
(PB82-113523; CUED/C-MATS/TR-74-1981;
ISSN-0309-6505) Avail: NTIS HC A03/MF A01 CSCL 11D

Analytical expressions are presented which predict the debonding and pull out lengths observed in brittle fiber composites. These characteristic lengths are combined with models of four toughening mechanisms to calculate the work of fracture of a composite. GRA

N82-18332# Cambridge Univ. (England). Dept. of Engineering.
FAILURE OF FIBROUS COMPOSITES. PART 1: STRESS CONCENTRATION, CRACKS AND NOTCHES. PART 2: TOUGHNESS
Peter W. R. Beaumont 1981 21 p refs Submitted for publication
(PB82-113531; CUED/C-MATS/TR-78-1981;
ISSN-0309-6505) Avail: NTIS HC A02/MF A01 CSCL 11D

A fibrous composite containing a notch or hole in monotonic loading exhibits premature cracking at stresses significantly lower than the ultimate strength; strength; interfacial shear cracking, delamination or splitting, fiber fracture, matrix cracking and so forth. The formation of a damaged region is due to the concentration of localized tensile and shear stresses close to the notch front. The precise mode of failure depends upon the orientation of fibers and stacking geometry of the laminate, it is also sensitive to the properties of the matrix and fiber matrix interface; and to the stress state and environment. The micromechanisms of crack extension in various classes of fibrous composites and includes models to account for the origins of toughness are surveyed. Author (GRA)

N82-18333# Cambridge Univ. (England). Dept. of Engineering.
MICROMECHANISMS OF FRACTURE AND HYPOTHERMAL AGING OF FIBROUS COMPOSITES Final Report, 1 Aug. 1978 - 31 Dec. 1980
Peter W. R. Beaumont 28 Feb. 1981 73 p refs
(Grant AF-AFOSR-3644-78; AF Proj. 2307)
(PB82-121369; CUED/C-MAT/TR-76-181) Avail: NTIS HC A04/MF A01 CSCL 11D

The micromechanisms of crack extension of carbon fibers, glass fibers, and hybrid composites containing glass fibers, and carbon fibers in epoxy and polyester resins were studied. A new collection of failure data based on observations of fibers debonding snapping and pulling out was summarized in cumulative probability diagrams and analyzed using Weibull distribution parameters. This data, together with models of failure processes and information of work of fracture, is used to construct fracture mechanism diagrams. These diagrams, together with the Weibull parameters may help in distinguishing between mechanisms of fracture give guidance in selecting a material system and in isolating aging and environmental effects. Author (GRA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N82-18334 California Univ., Berkeley.
SOOT RADIATION FROM DIFFUSION FLAMES Ph.D. Thesis
Siu-Chun Lee 1981 111 p
Avail: Univ. Microfilms Order No. 8200178

A dispersion model for the optical constants of soot in hydrocarbon flames was established on the basis of a rigorous consideration of the electronic band structure and the dispersion constants. The dispersion constants of hydrocarbon soot were determined from this model in conjunction with in-situ flame transmission data in the visible and infrared ranges, thus truly reflecting that of soot in flames. It is shown that the soot optical properties are rather insensitive to temperature changes at elevated temperatures. However, the room temperature optical properties, representative of soot in smoke, exhibit appreciable deviation from the high temperature values. Soot particles in flames are usually polydisperse and their sizes and volume fractions may be determined from flame transmission data in the visible range by assuming a size distribution. The effect of soot shape on soot radiation from flames and smoke was examined. It is realized that soot particles always conglomerate into different shapes, while the limiting shapes are spheres and long chains modeled as infinite cylinders. Dissert. Abstr.

N82-18335 Pennsylvania State Univ., University Park.
PHYSICOCHEMICAL PROPERTIES OF DIESEL PARTICULATE MATTER Ph.D. Thesis
Mark McCauley Ross 1981 129 p
Avail: Univ. Microfilms Order No. 8129208

The sorption of selected compounds onto Diesel particulate matter generated by two different engines was studied using two methodologies. A dynamic technique, gas-solid chromatography, was employed to measure heats of adsorption at low coverage. Effects of particle pretreatments and varying adsorbate coverages on the apparent heats of sorption were also investigated. A static technique of measuring adsorption isotherms by a volumetric methodology was used to determine B.E.T. surface areas, pore size distributions, and heats of adsorption as a function of surface coverage. Electron microscopy was used to measure mean particle diameters and external surface areas. The electron paramagnetic resonance (EPR) signal of the particles was monitored. EPR spectrometry was shown to be a convenient method of distinguishing between particulate samples from different engines and operating conditions and of following certain adsorbate/adsorbent interactions. Dissert. Abstr.

N82-18336 California Univ., Berkeley.
COMPETING REACTION CHANNELS IN IR LASER INDUCED UNIMOLECULAR REACTIONS Ph.D. Thesis
Michael Robert Berman 1981 246 p
Avail: Univ. Microfilms Order No. 8200019

The competing reaction channels in the unimolecular decomposition of two molecules, formaldehyde and tetralin were studied. A TEA CO2 laser was used as the excitation source in all experiments. The dissociation of D2CO was studied by infrared

multiphoton dissociation (MPD) and the small-molecule nature of formaldehyde with regard to MPD was explored. The effect of collisions in MPD were probed by the pressure dependence of the MPD yield and IR fluorescence from multiphoton excited D2CO. The wavelength and power dependence of MPD were also studied. The unimolecular decomposition of tetralin was studied by MPD and SiF4 sensitized pyrolysis. Dissert. Abstr.

N82-18337 California Univ., Berkeley.
MULTIPHOTON DISSOCIATION AND THERMAL UNIMOLECULAR REACTIONS INDUCED BY INFRARED LASERS Ph.D. Thesis
Hai-Lung Dai 1981 233 p
Avail: Univ. Microfilms Order No. 8200071

Multiphoton dissociation (MPD) of ethyl chloride was studied using a tunable 3.3 micron laser to excite CH stretches. The absorbed energy increases almost linearly with fluence, while for 10 micron excitation there is substantial saturation. Much higher dissociation yields were observed for 3.3 micron excitation than for 10 micron excitation, reflecting bottlenecking in the discrete region of 10 micron excitation. Resonances in MPD yields vs frequency in the 3.3 micron region match the position and shape of peaks in the fundamental, as narrow as 0.4/cm and first and second overtone absorption spectra. Transitions through the discrete levels are all at or nearly resonant. Anharmonicity is compensated by the presence of five CH stretch modes. Overtone spectra show that line broadening already occurs at the v sub CH = 2 level and that v sub CH = 3 is clearly in the quasicontinuum. The resonant nature of the excitation allows the rate equations description for transitions in the quasicontinuum and continuum to be extended to the discrete levels.
Dissert. Abstr.

N82-18338 Illinois Univ. at Urbana-Champaign.
SELECTIVE JET PLATING Ph.D. Thesis
Tan-Jen Chen 1981 204 p
Avail: Univ. Microfilms Order No. 8127565

The use of an unsubmerged impinging jet system for selective plating is proposed. A theoretical analysis, which accounted for the charge transfer, mass transfer, and ohmic resistance effects, was developed to predict the current distributions along the cathode. Three electrochemical systems were employed in an experimental jet plating cell to demonstrate the validity of the model. The current distributions were measured with controlled variation of jet Reynolds number, nozzle-to-cathode distance, solution specific conductivity, and reactant concentration. Upon demonstrated to be valid, the theoretical model was used to predict the cell performance under a wide range of parameter values. Dissert. Abstr.

N82-18339 Princeton Univ., N. J.
THE THEORY AND APPLICATION OF TEMPERATURE PROGRAMMED DESORPTION IN THE STUDY OF UNSUPPORTED IRON AND IRON-COPPER FISCHER-TROPSCH SYNTHESIS CATALYSTS Ph.D. Thesis
Effiong Etukudo Ibok 1981 254 p
Avail: Univ. Microfilms Order No. 8126072

The shape index method is proposed for the analysis of temperature programmed desorption spectra. A criterion for estimating diffusional influences in TPD from porous systems is also proposed. Unsupported iron and iron-copper catalysts were studied by the adsorption and temperature programmed desorption of CO and CO2. And the effect of potassium and carbon additives on the adsorption and TPD of these gases was investigated. The reported spectra are net thermal conductivity responses. Based on an X-ray/SEM study, a model is proposed according to which the surface layers become depleted of copper during pretreatment. The relevance of all these findings to the Fischer-Tropsch synthesis is discussed. Dissert. Abstr.

N82-18340 Minnesota Univ., Minneapolis.
EXPERIMENTAL AND THEORETICAL STUDIES ON GAS CYCLONE SEPARATORS OPERATING AT HIGH EFFICIENCY Ph.D. Thesis
Thinh Van Tran 1981 161 p
Avail: Univ. Microfilms Order No. 8126034

It was shown that wall friction has negligible effect on particle motion, but dust particles on the wall move much more slowly than the surrounding gas, due to crowding. It was found that re-entrainment of particles in the region near the cone apex of a cyclone is a significant factor affecting collection efficiency of low and moderate efficiency cyclones. A theory on the secondary flow along the cone wall was developed. Short circuit flow on the top of a cyclone was also studied. The effect of this flow on efficiency was also studied. The secondary flow velocity was found to be dependent on inlet geometry and is of order of 15% that of the main flow. A simplified theory was developed to give the flow field in gas cyclones. It was shown that the particle volume fraction inside the dust spiral on a cyclone wall is of the same order as the emulsion phase in fluidized systems. Dissert. Abstr.

N82-18341 Louisiana State Univ. and A&M Coll., Baton Rouge.
FREQUENCY RESPONSE ANALYSIS OF DISTILLATION COLUMN INTERACTION Ph.D. Thesis
Chien Wang 1981 338 p
Avail: Univ. Microfilms Order No. 8126983

A dynamic pressure model of multicomponent distillation is developed in the frequency domain. The model consists of a set of linearized overall and component balances, enthalpy balance, pressure relationship, hydraulic equation and equilibrium relationships for each tray, the condenser and the reboiler of a general column. A numerical method consisting of total scaled pivoting Gaussian elimination with the method of residues is worked out for solving the model in the frequency domain to obtain all of the desired transfer functions. As a result, this analysis can be useful in defining the control problem and predicting interaction difficulties. The computer program developed can be used to study the effect of different model simplifying assumptions. The models studied were pressure model, enthalpy model and quimolar overflow model. A steady state program and a mechanical design program were also developed.
Dissert. Abstr.

N82-18342# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Earth Sciences Branch.
IDENTIFYING AND DETERMINING HALOCARBONS IN WATER USING HEADSPACE GAS CHROMATOGRAPHY
Daniel C. Leggett Oct. 1981 17 p refs
(Proj. CWIS-31281)
(AD-A108345; CRREL-SR-81-26) Avail: NTIS HC A02/MF A01 CSCL 07/4

Since the discovery that chloroform and other haloforms are produced during water chlorination, methods have been needed for their routine analysis. This report describes the application of the multiple equilibration headspace technique for the determination of halocarbons in water. This method has certain advantages over solvent extraction and direct injection techniques, including greater sensitivity because of the favorable, gas/liquid distribution ratios. It is simpler and faster than purge and trap and resin sorption methods and gives more information about compound indentity than single headspace analysis because gas/liquid distribution ratios are determined experimentally. The method is absolute, unlike solvent extraction, resin sorption, purge and trap, and conventional headspace analysis, which require standard additions to correct for incomplete recovery. The use of the technique to analyze chlorinated water samples for haloforms revealed a potential problem in their analysis. Haloforms continued to form for 24 hours, even after destruction of chlorine residuals with thiosulfate. Maximum haloform concentrations were observed in undechlorinated samples only after a 48 hour aging period. GRA

N82-18343# National Bureau of Standards, Washington, D.C. Chemical and Biodegradation Processes Group.
THE USE OF ELEMENT-SPECIFIC DETECTORS COUPLED WITH HIGH-PERFORMANCE LIQUID CHROMATOGRAPHS Interim Technical Report
K. L. Jewett and F. E. Brinckman 4 Nov. 1981 47 p refs Submitted for publication
(Contract N00014-81-F-0013; NR Proj. 083-471)
(AD-A108539) Avail: NTIS HC A03/MF A01 CSCL 07/4

Element-specific detectors (ESDs) provide an excellent means of determining the molecular character and elemental composition of complex column effluents when used in tandem with HPLC systems. General purpose flame and electrothermal AA units

along with inductively coupled and direct current plasma detectors are discussed in terms of the inherent advantages, difficulties and detection limits associated with using such systems. Other, more limited ESDs, such as flame photometric detectors are also compared. The HPLC-ESD interface remains the largest hurdle to increased utilization of this new analytical probe and attempts to solve or minimize this problem are reviewed. Recent applications involving HPLC-ESD systems illustrate the important role that these detectors can and will play in solving a wide variety of specification problems with biological, environmental, and energy-related matrices. Over 100 literature citations are provided. Author (GRA)

N82-18344# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.

WEAK AND STRONG IGNITION. 1: NUMERICAL SIMULATIONS OF SHOCK TUBE EXPERIMENTS

E. S. Oran, T. R. Young, J. P. Boris, and A. Cohen (Ballistic Research Labs.) 7 Dec. 1981 37 p refs
(RR0130144; ZF43451001)
(AD-A108363; NRL-MR-4664) Avail: NTIS HC A03/MF A01 CSCL 21/2

Detailed one-dimensional calculations were performed to simulate weak and strong ignition in reflected shock tube experiments in hydrogen-oxygen-argon mixtures. It is found that the experiment and simulations agree well in the strong ignition case studied. In the weak ignition case, the simulations show the same qualitative behavior as the experiment. Here ignition starts at a distance away from the reflecting wall at a time much earlier than the calculated chemical induction time. This latter effect is shown to arise because of the sensitivity of the chemical induction time to fluctuations in the calculation. In the calculations these fluctuations arise from small numerical inaccuracies. In experiments, they can arise from a number of sources including nonuniformities in the incident shock wave leading to nonuniform reflection, thermal conduction to the walls, and interactions with boundary layers. Author (GRA)

N82-18345# Naval Research Lab., Washington, D. C. Surface Chemistry Branch.

QUANTITATIVE CHROMATOGRAPHIC ANALYSES OF N-PHENYL-ALPHA-NAPHTHYLAMINE AND N-PHENYL-BETA-NAPHTHYLAMINE Interim Report

P. J. Sniegoski 4 Dec. 1981 14 p refs
(AD-A108362; NRL-MR-4704) Avail: NTIS HC A02/MF A01 CSCL 07/4

Three convenient chromatographic methods were developed for the quantitative analysis of N-phenyl-beta-naphthylamine in samples of N-phenyl-alpha-naphthylamine. The TLC method makes use of dipropylene glycol impregnated silica gel plates. XE-60 is utilized in the GC method, and a column packed with NH 210 micrometers is used in the LC separation. Analyses were carried out on various commercial samples of N-phenyl-alpha-naphthylamine that were to be used as an antioxidant in aircraft engine lubricants. Author (GRA)

N82-18346# Massachusetts Inst. of Tech., Cambridge. Dept. of Physics.

ELECTRON ENERGY LOSS SPECTROSCOPY OF GALLIUM ARSENIDE AND OTHER MATERIALS Annual Progress Report, 1 Jul. 1980 - 30 Jun. 1981

Margaret H. Weiler 10 Nov. 1981 17 p
(Contract F49620-79-C-0176; AF Proj. 2306)
(AD-A108657; AFOSR-81-0800TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report describes the construction and testing of a new electron energy loss spectrometer to study the band structure of GaAs and other materials using the inelastic scattering of 230keV electrons. Substantial progress has been made towards the realization of a working experiment in high-energy electron energy loss spectroscopy, with which to study the electronic states in GaAs and other materials. In the following sections we give details of our progress in the major components of the project: electron optics, electronics, high-voltage terminal, sample preparation, and data reduction. GRA

N82-18347# Michigan State Univ., East Lansing. Dept. of Chemistry.

SOME COMPARISONS BETWEEN THE ENERGETICS OF ELECTROCHEMICAL AND HOMOGENEOUS ELECTRON-TRANSFER REACTIONS

Michael J. Weaver and Joseph T. Hupp 23 Nov. 1981 35 p refs Submitted for publication
(Contract N00014-79-C-0670)
(AD-A108195; TR-6) Avail: NTIS HC A03/MF A01 CSCL 07/4

Some conceptual relationships between the kinetics of corresponding electrochemical and homogeneous redox processes are discussed and applied to experimental data for suitable outer-sphere reactions in order to illustrate the utility of electrochemical kinetics for gaining some fundamental insights into the energetics of electron-transfer processes. It is pointed out that electrochemical kinetics and thermodynamics measurements as a function of temperature and electrode potential yield direct information on the shapes of the potential-energy surfaces and free energy barriers for individual redox couples. Comparisons between kinetics parameters for corresponding electrochemical and homogeneous exchange reactions show reasonable agreement with the predictions of the conventional 'weak overlap' model for several aquo redox couples, but exhibit substantial disagreement for couples containing amine and related ligands. These latter discrepancies may arise from the closer approach of the amine reactants to the electrode surface compared with the strongly solvated aquo complexes. A comparison is also made between the effects of varying the thermodynamic driving force upon the kinetics of related electrochemical and homogeneous reactions. It is shown that the apparent discrepancies seen between the predictions of the harmonic oscillator model and experimental data for some highly exoergic homogeneous reactions may be related to the anomalously small dependence of the rate constant upon overpotential observed for the electrooxidation of aquo complexes. This behavior seems most likely to be due to a marked asymmetry of the reactant and product free energy barriers for these half reactions. GRA

N82-18348# Naval Weapons Center, China Lake, Calif.

ENERGY CONTRIBUTIONS ASSOCIATED WITH COMBUSTION INSTABILITY Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981

H. B. Mathes 30 Sep. 1981 9 p ref
(AD-A108137) Avail: NTIS HC A02/MF A01 CSCL 21/2

The investigation of new and novel laboratory test techniques for determining the acoustic energy contributions of burning propellants will be pursued. Emphasis will be on methods that provide a more direct measurement than presently employed. Initial effort will be focused on methods for directly determining the response of solid propellant combustion to incident acoustic pressure waves. If successful, the method, or methods for pressure-coupled measurement will be modified to provide direct velocity-coupled response measurements. These methods are expected to lower the cost of characterizing the acoustic combustion response of solid propellant formulations of interest to the Navy and to provide improved accuracy of measurement. GRA

N82-18349# Naval Weapons Center, China Lake, Calif.

FUEL-RICH PLUME COMBUSTION Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981

K. C. Schadow, M. J. Lee, and K. C. Wilson 30 Sep. 1981 7 p refs
(AD-A108136) Avail: NTIS HC A02/MF A01 CSCL 21/2

Experiments are being performed using an axisymmetric gas generator ramjet. Axial and radial profiles of pressure, velocity, turbulence intensity, temperature, and species concentration are being determined using non-interference optical diagnostic techniques (laser Doppler velocimeter (LDV)) and intrusive probes. The experimental data are being compared with analytical models developed by Science Application, Inc. (SAI) under an Air Force Office of Scientific Research (AFOSR) contract. An axisymmetric, 5-inch diameter laboratory ramjet combustor was built and checked out. Experiments were initiated using (1) an LDV and a hot-wire anemometer for velocity and turbulence intensity measurements, (2) coated thermocouples for temperature measurement, and (3) a gas chromatograph for analysis of gas samples. GRA

N82-18350# California Univ., Irvine. Combustion Lab.
MECHANISMS OF EXHAUST POLLUTANTS AND PLUME FORMATION IN CONTINUOUS COMBUSTION Annual Report, 1 Mar. 1980 - 28 Feb. 1981
G. S. Samuelsen Mar. 1981 16 p
(Grant AF-AFOSR-3586-78; AF Proj. 2308)
(AD-A109059; UCI-ARTR-81-03; AFOSR-81-0814TR) Avail: NTIS HC A02/MF A01 CSCL 21/2

During this period, emphasis has been placed on the construction, evaluation, and operation of a two-color laser anemometry (LA) system. Detailed velocity and turbulence intensity measurements have also been acquired in a water analog of the opposed jet configuration, and are scheduled for the centerbody configuration. Application of the numerical code to this case was initiated during the present reporting period for both the opposed jet and centerbody configurations, and the results are being checked with the experimental data as they become available. High-speed photography has been employed in both the combustor and hydrodynamic facilities to study the swirl and non-swirl performance of the centerbody configuration, and to optimize the design. Techniques have been developed (dyes in the hydrodynamic system and smoke in the combustor) to visually record the penetration and dynamics of the fuel jet. The NO probe experiments have addressed the effect of potentially resistant materials, and a refined experiment for the introduction of water and low concentrations of hydrocarbons typical of turbine emission has been completed. Data provide guidelines for the materials and temperature limits to employ in the measurement of NO(x). GRA

N82-18351# Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).
SOLVATION OF SOME NON-METALS IN LIQUID LITHIUM AND SODIUM
N. A. Rumbaut Jun. 1980 21 p refs
(BLG-536) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Equations are presented which relate the thermodynamic activity of dissolved nonmetals (H, C, O and N) to their chemical concentration in liquid lithium and sodium. DOE

N82-18352# Peabody-Gordon-Piatt, Inc., Winfield, Kans.
DIRECT COMBUSTION OF INDUSTRIAL DRY, COMPOSITE WASTE IN SUSPENSION Final Report, 1 Apr. 1978 - 31 Aug. 1981
L. G. Desmon and G. J. Hottinger Aug. 1981 101 p refs
(Contract DE-AC03-78ET-13148)
(DE81-030679; DOE/ET-13148/T1) Avail: NTIS HC A06/MF A01

The objectives of this project are to: identify classifications of industrial sites producing sufficient industrial wastes to satisfy ongoing energy requirements for a refuse boiler and develop the technology necessary for acceptance by industry of systems fired by solid refuse-derived fuels in suspension-type burners. Fifteen industrial sites were identified. A full-scale combustion test facility was designed, built and installed at the Peabody Gordon-Piatt Plant in Winfield, Kansas. Ten ton samples of waste from 5 sites were brought to the test facility, prepared as fuels, and burned. Results of these combustion tests are presented. DOE

N82-18353# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
THREE-STAGE MASS SPECTROMETER FOR ISOTOPIC ANALYSIS OF RADIONUCLIDES IN ENVIRONMENTAL SAMPLES
J. E. Halverson Sep. 1981 14 p refs
(Contract DE-AC09-76SR-00001)
(DE82-001739; DP-1611) Avail: NTIS HC A02/MF A01

A three-stage mass spectrometer was constructed for isotopic analysis of several radioactive as well as stable elements at environmental levels. The spectrometer is interfaced to a digital computer, which controls the operation of the spectrometer, accumulates data, reduces data, and prints a final result. The spectrometer has demonstrated the capability of measuring the isotopic composition of plutonium samples as small as 0.005 picogram and has an abundance sensitivity greater than 10 to the 8th power. DOE

N82-18354# Texas A&M Univ., College Station. Dept. of Physics.
HYPERFINE STRUCTURE AND ISOTOPE-SHIFT MEASUREMENTS OF SHORT-LIVED ELEMENTS BY LASER SPECTROSCOPY Progress Report, 1 Jan. 1980 - 31 Aug. 1981
Hans A. Schuessler Sep. 1981 13 p refs
(Contract DE-AS05-80ER-10578)
(DE82-001999; DOE/ER-10578/1; RF-82-4(4228)) Avail: NTIS HC A02/MF A01

Numerical studies of the trapping of continuous ion beams injected into various ion traps, and the trapping of the pulsed ion beams injected into a radio frequency ion trap are reported. A plasma ion source and a radio frequency ion trap were constructed. A laser system for the spectroscopy of stored ions was developed, and experiments with quartz cells a high temperatures were made. DOE

N82-18355# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATIONS BY MEANS OF LASER FLUORESCENCE SPECTROSCOPY OF THE SYSTEM (A/SUPER 1/CAPITAL SIGMA/SUPER PLUS/-X/SUPER 1/CAPITAL SIGMA/SUPER PLUS/) OF LI(F)D [LASERFLUORESZENZSPEKTROSKOPISCHE UNTERSUCHUNGEN AN DEM (A/SUPER 1/ CAPITAL SIGMA/SUPER PLUS/-X/SUPER 1/CAPITAL SIGMA/ SUPER PLUS/)-SYSTEM VON (F)LID]
Bernd Fiedler Oct. 1980 62 p refs In GERMAN
(MPIS-19/1980; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,15

Laser fluorescent spectroscopic measurements of molecular rotation and oscillation parameters of the electronic original state of the molecule LiD are discussed. The spectra were registered by photoelectric photometry. The following items are examined: (1) apparatus, production of 7LiD spectra, reference systems, production of the calibration spectra; (2) measurements, photographic recording, identification and measurement of the spectral lines, calculation of wavelength; (3) molecular rotation and vibration, parameters of the X-state. Transl. by E.A.K.

N82-18356# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MODE SELECTIVE VIBRATIONAL ENERGY TRANSFER IN METHYLFLUORIDE Ph.D. Thesis - Georg-August Univ. [MODENSELEKTIVE GUNG IN METHYLFLUORID]
Roland Stender May 1981 100 p refs In GERMAN
(MPIS-6/1981; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18,90

The influence of reaction speed on vibration energy transfer in molecules and overcoming energy barriers and their contribution to the reactions was studied. In slow relaxation processes the unequal weight distribution caused by lasers remains longer, so that most of the excited molecules cause a reaction which gives high production output and compared to thermal drop obtains a higher reaction speed. Characteristics of CH3F molecules, determination of excitation degree, experimental build up, and evaluation of fluoride measurements for CH3F without inert gas are discussed. Transl. by E.A.K.

N82-18357# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
DEFECTS CHARACTERIZATION AND DIMENSIONING BY MEANS OF THE ULTRASOUND SPECTROSCOPY [DIMENSIONAMENTO E CARATTERIZZAZIONE DI DIFETTI MEDIANTE SPETTROSCOPIA ULTRASONORA]
M. Certo, G. Redondi, and F. Tonolini 1981 19 p ref In ITALIAN Presented at 12th Convention sulle Prove non Distruttive, Rapallo, Italy, 2-4 Mar. 1981
(CISE-1695) Avail: NTIS HC A02/MF A01

A method for measuring defects based on the frequency and deconvolution of ultrasonic echoes is described. Wide band sounds are placed in contact with the specimen at various angles of incidence. The analysis of the echoes is performed in a compact and portable instrument which determines the shape and depth of defects. The orientation of a plane defect can be determined. Laboratory investigations of real and artificial defects are described.

and industrial applications of the technique suggested.
Transl. by J.D.H.

N82-18358# SumX Corp., Austin, Tex.
FEASIBILITY OF PHOTOCATALYTIC OXIDATION FOR WASTEWATER CLEAN-UP AND REUSE Progress Report, 4 Mar. - 31 Mar. 1981
Gary R. Peyton and David W. DeBerry 1981 55 p refs
(Contract DI-14-34-0001-9425)
(PB82-108457; W81-05701; OWRT-C-90152-R(9425)(1))
Avail: NTIS HC A04/MF A01 CSCL 07D

A feasibility study was conducted on a new treatment technology for the destruction of pollutant compounds in wastewater. The process uses solar energy to drive an oxidant which is photocatalyzed at the surface of a semiconductor powder. The process was investigated particularly for water clean-up prior to industrial resuse, because of its non-energy-intensive nature. Five compounds (chloroform, dimethylamine, methanol, phenol, and ammonia) were used as model substrates, and removal at several pH values, using three different semiconductor (TiO2 ZnO, and Fe2O3) was investigated the laboratory, using a xenon lamp to simulate solar radiation. While Fe2O3 was found to be ineffective, both ZnO and TiO2 catalyzed the removal of all compounds. GRA

N82-18359# Notre Dame Univ., Ind. Radiation Chemistry Data Center.
OPTICAL SPECTRA OF NONMETALLIC INORGANIC TRANSIENT SPECIES IN AQUEOUS SOLUTION
Gordon L. Hug 1981 169 p refs Prepared for National Standard Reference Data System
(PB82-109141; NSRDS-NBS-69; LC-80-606826) Copyright.
Avail: NTIS HC A08/MF A01 CSCL 07D

Optical absorption spectra are presented for 77 nonmetallic, inorganic radicals and radical ions, produced by radiolysis or photolysis in aqueous solution. This atlas results from the compilation, evaluation, and replotting of spectra from the literature. Additional information is included such as extinction coefficients, initial chemical conditions, methods of transient generation and spectral acquisition, references, mechanisms of transient formation and notes on dosimetry. GRA

N82-18360# Intermountain Forest and Range Experiment Station, Ogden, Utah.
EVALUATION OF MEGATARD 2700: A PROPOSED NEW FIRE RETARDANT SYSTEM
Charles W. George and Cecilia W. Johnson Aug. 1981 26 p refs
(PB82-108515; FSGTR/INT-112) Avail: NTIS HC A03/MF A01 CSCL 21B

A proposed new fire retardant system uses an ammonium sulfate based concentrate to which a gum thickener (with or without coloring) is added as the solution is delivered to the aircraft. Attention is given to the physical and chemical characteristics and performance of the final retardant solution. Suggestions are presented for potential product improvement and recommendations are made for further evaluation and a cost-to-benefit analysis. GRA

N82-18361# Technische Hogeschool, Delft (Netherlands).
AMMOXIDATION OF TOLUENE AND XYLENES TO NITRILES
Johannes Jacobus Joseph denRidder 1981 136 p refs
(PB82-105420) Avail: NTIS HC A07/MF A01 CSCL 07D

The kinetics and mechanism of the ammoxidation of toluene and xylene were investigated. Two different types of catalysts were used in order to examine what similarities existed between the catalyst and, in particular, whether similar or different mechanisms occurred. GRA

N82-18362# Monsanto Research Corp., Dayton, Ohio.
POTENTIAL ATMOSPHERIC CARCINOGENS, PHASE 2/3: ANALYTICAL TECHNIQUE AND FIELD EVALUATION Final Report, Nov. 1978 - Oct. 1980
D. S. West, F. N. Hodgson, J. J. Brooks, D. G. DeAngelis, A. G. Desai, and C. R. McMillin Jun. 1981 267 p refs
(Contract EPA-68-02-2773)
(PB82-102476; EPA-600/2-81-106; MRC-DA-1078) Avail: NTIS HC A12/MF A01 CSCL 07D

A sampling system was developed to collecting 20 significant probable or possible atmospheric carcinogens from ambient air. The sampling system is based on a combination of solid sorbent materials arranged in series. Air samples are drawn through this system using a pump. The system was evaluated in sampling trips. Results for the analyses for the 20 selected compounds are broad scan data are presented. Analyses were accomplished using thermal desorption of the sorbent materials followed by capillary column gas chromatography/mass spectrometry (GC/MS). A multidetector capillary column GC system having a conventional flame ionization detector, a N-P flame ionization detector, a photoionization detector and an electron capture detector was also used. GRA

N82-18363# Gulf South Research Inst., New Orleans, La.
DEVELOPMENT OF NOVEL POROUS SUBSTRATES FOR ULTRAFILTRATION, DESALINATION AND WATER RECLAMATION, PART 2 Final Report
Israel Cabasso 5 May 1981 69 p refs
(Contract DI-14-34-0001-9517)
(PB82-103920; W81-05352; OWRT-C-90264-D(9517)(1))
Avail: NTIS HC A04/MF A01 CSCL 07D

Porous, synthetic polymer substrates were developed as support components for composite desalination membranes. The selected material was methyl-brominated poly(bromophenylene oxide), or M-PPO, a hydrophobic polymer readily formulated and cast into large, flat-sheet membranes. Morphological characterization of M-PPO substrates by scanning electron microscope revealed the spongelike matrix structure. Dried substrates could be rewetted by using a wetting agent. Preparation of composite membranes involved deposition of a dense, ultrathin, permselective layer on the porous substrate. Two successful approaches were in the in situ polycondensation of two reactive prepolymers to the substrate surface, and the direct application of a dilute polymer solution. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mecnanical properties of metals, e.g., corrosion; and metallurgy.

N82-18364 Illinois Univ. at Urbana-Champaign.
AN EXPERIMENTAL DETERMINATION OF THE EFFECT OF CYCLIC STRESS ON VOID GROWTH IN ULTRA-HIGH-PURITY ALUMINUM DURING SIMULTANEOUS 800 MeV PROTON IRRADIATION Ph.D. Thesis
Walter Frank Sommer 1981 91 p
Avail: Univ. Microfilms Order No. 8127695

The theory that edge dislocations, set into oscillatory motion by an applied cyclic stress, would 'sweep up' excess radiation produced vacancies that would otherwise produce void growth was tested. Post-irradiation examination by transmission electron microscopy gave results qualitatively consistent with the theory. The simulation potential of the 800 MeV proton for CTR 14 MeV neutron effects is favorable, especially since 800 MeV protons yield large amounts of transmutation product gases such as hydrogen and helium. The large experimental volume at LAMPF greatly facilitated use of large, complicated hardware, relative to what can be considered for the core of a fission reactor. In addition, the flux of protons is contained in a directable beam which can be controlled to irradiate only the sample material.
Dissert. Abstr.

N82-18365 California Univ., Berkeley.
THE SURFACE PROPERTIES AND FLOTATION OF RARE EARTH MINERALS Ph.D. Thesis
Pradip 1981 222 p
Avail: Univ. Microfilms Order No. 8200241

The related flotation chemistry of bastnaesite are minerals is examined. The Hallimond tube and Denver cell flotation tests together with the adsorption and electrokinetic studies are described. The synthesis and the surface-chemical characterization of the mineral bastnaesite is also studied. Electrokinetic investigations of bastnaesite, barite, and calcite in the presence of added flotation reagents revealed that under flotation conditions

in the plant, calcite is positively charged, bastnaesite negatively charged whereas barite surface is being converted into barium carbonate. The addition of soda ash and lignin sulfonate depressant is, though, crucial in controlling flotation, the selective adsorption of chemisorbing fatty acids (tall oil) at high temperature is the key to successful beneficiation of this ore. The preliminary studies and laboratory scale flotation tests on the bastnaesite ore indicate that alkyl hydroxamates are very promising collectors for the beneficiation of ores such as those that occur at Mountain Pass. Dissert. Abstr.

N82-18366 Ohio State Univ., Columbus.
STUDIES ON PLASTIC INSTABILITY, NOTCH DEFORMATION AND HYDROGEN EFFECTS IN SPHEROIDIZED STEEL Ph.D. Thesis
Oliver Amanze Onyewuenyi 1981 293 p
Avail: Univ. Microfilms Order No. 8129071

Detailed studies on the mechanics of deformation and crack initiation at a U-notch in spheroidized AISI 1090 steel were conducted both with and without cathodically charged hydrogen. For large scale plasticity at a U-notch root, the principal plastic strain distribution does not follow a hyperbolic law, but may be described in the form epsilon sub 2 = P sub 1 exp (P sub 2 x/rho) where P sub 1 and P sub 2 are functions of plastic bend angle. The region of maximum strain gradient may be approximated by epsilon sub 2 = 0.08(1 + x*/rho) where x*/rho represents the process zone size for each plastic bend angle. Analysis of notch surface deformation patterns shows that surface instabilities form at a critical strain that is in fair agreement with predictions based on bifurcation analysis. Plastic instability initiates first at the notch surface in the form of instability bands independent of the presence of voids. Surface microcracks initiate within the instability bands. Crack initiation in the notch root process zone is characterized by the opening and extension of surface microcracks along characteristic slip lines accentuated by the extent of localized void profusion beneath the notch root. Dissert. Abstr.

N82-18367 Illinois Inst. of Tech., Chicago.
KINETICS OF CRACK INITIATION AND PROPAGATION IN METAL-INDUCED EMBRITTLEMENT OF 4140 STEEL BY INDIUM Ph.D. Thesis
Henry Hang-Ling An 1981 122 p
Avail: Univ. Microfilms Order No. 8200480

Metal induced embrittlement (MIE) of 4140 steel by indium was studied using delayed failure tensile tests. The temperature and stress dependence of the kinetics of crack initiation and crack propagation in both liquid metal induced and solid metal induced cracking were examined in the same system for the first time in MIE using electrical potential drop measurements along the indium covered portion of the sample gage length to record the start and progress of cracking, and also through fractographic observations. Crack propagation in SMIE (solid metal induced embrittlement) was found to have rates and an activation energy indicating that the process is rate controlled by the surface self diffusion of indium on the crack surface. In contrast, crack propagation in LMIE (liquid metal induced embrittlement) is believed to be a process involving transport of the indium by bulk liquid flow. Crack initiation was thermally activated, and in both LMIE and SMIE the apparent activation energy was the same within experimental error. Dissert. Abstr.

N82-18368*# Westinghouse Electric Corp., Pittsburgh, Pa.
EVALUATION OF PRESENT THERMAL BARRIER COATINGS FOR POTENTIAL SERVICE IN ELECTRIC UTILITY GAS TURBINES Final Report
R. J. Bratton, S. K. Lau, and S. Y. Lee Jul. 1982 161 p refs Sponsored in part by Electric Power Research Inst.
(Contract NAS3-21377)
(NASA-CR-165545; Rept-81-9D6-NASAC-R3) Avail: NTIS HC A08/MF A01 CSCL 11F

The resistance of present-day thermal barrier coatings to combustion gases found in electric utility turbines was assessed. The plasma sprayed coatings, both duplex and graded types, were primarily zirconia-based, although a calcium silicate was also evaluated. Both atmospheric burner rig tests and high pressure tests (135 psig) showed that several present-day thermal barrier coatings have a high potential for service in gas turbines burning the relatively clean GT No. 2 fuel. However, coating improvements are needed for use in turbines burning lower grade fuel such as residual oil. The duplex ZrO2.8Y2O3/NiCrA1Y coating was ranked highest and selected for near-term field testing, with Ca2SiO4/NiCrA1Y ranked second. Graded coatings show potential for corrosive turbine operating conditions and warrant further development. The coating degradation mechanisms for each coating system subjected to the various environmental conditions are also described. B.W.

N82-18369*# California Univ., Santa Barbara. Quantum Inst.
AN INVESTIGATION OF THE KINETICS FOR HYDROGEN CHEMISORPTION ON IRON METAL SURFACES Final Report, Apr. 1977 - Mar. 1980
Mickey R. Shanabarger Mar. 1980 33 p refs
(Grant NsG-2222)
(NASA-CR-168555) Avail: NTIS HC A03/MF A01 CSCL 11F

A quasi-isothermal approach was used to study the kinetics of hydrogen and hydrogen sulfide chemisorption onto iron film in an effort to understand the environmental degradation of steels. The coverage of chemisorbed hydrogen or chemisorbed sulfur was observed as a function of time for fixed conditions of substrate temperature. Auger electron spectroscopy was used to observe the sulfur and chemisorption-induced resistance change was employed to monitor hydrogen coverage. To compare the results obtained from studying the kinetics by two different techniques, the kinetics of oxygen chemisorption onto iron films was also studied. A reaction model utilized to interpret the H2/Fe2 chemisorption kinetics was applied to data from an earlier study on the desorption kinetics for H2 chemisorbed onto nicket films in the vicinity of the Curie temperature of the film. This analysis permitted a separation of the gross desorption process into individual components so that the influence of the magnetic phase transition on the rate constants could be determined.
A.R.H.

N82-18370*# TRW, Inc., Cleveland, Ohio. Materials Technology Lab.
DEVELOPMENT OF MATERIALS AND PROCESS TECHNOLOGY FOR DUAL ALLOY DISKS Final Report
James M. Marder and Charles S. Kortovich Oct. 1981 188 p refs
(Contract NAS3-21351)
(NASA-CR-165224; TRW-ER-8001-F) Avail: NTIS HC A09/MF A01 CSCL 11F

Techniques for the preparation of dual alloy disks were developed and evaluated. Four material combinations were evaluated in the form of HIP consolidated and heat treated cylindrical and plate shapes in terms of elevated temperature tensile, stress rupture and low cycle fatigue properties. The process evaluation indicated that the pe-HIP AF-115 rim/loose powder Rene 95 hub combination offered the best overall range of mechanical properties for dual disk applications. The feasibility of this dual alloy concept for the production of more complex components was demonstrated by the scale up fabrication of a prototype CFM-56 disk made from this AF-115/Rene 95 combination. The hub alloy ultimate tensile strength was approximately 92 percent of the program goal of 1520 MPa (220 ksi) at 480 C (900 F) and the rim alloy stress rupture goal of 300 hours at 675 C (1250 F)/925 MPa (134 ksi) was exceeded by 200 hours. The low cycle fatigue properties were equivalent to those exhibited by HIP and heat treated alloys. There was an absence of rupture notch sensitivity in both alloys. The joint tensile properties were approximately 85 percent of the weaker of the two materials (Rene 95) and the stress rupture properties were equivalent to those of the weaker of the two materials (Rene 95). Author

N82-18371# San Fernando Labs., Pacoima, Calif.
INVESTIGATION OF THE CNTD MECHANISM AND ITS EFFECT ON MICROSTRUCTURAL PROPERTIES OF SiC AND AlN Final Report
Deepak G. Bhat and Rodney M. Panos (Litton Industries, Woodland Hills, Calif.) Sep. 1981 188 p refs
(Contract F49620-79-C-0041; AF Proj. 2306)
(AD-A108581; AFOSR-81-0748TR) Avail: NTIS HC A09/MF A01 CSCL 11/6

The report describes the development of a CNTD process for silicon carbide. Following earlier work on resistance-heated substrate, attempts were made to develop a furnace process for CNTD SiC. High temperature flexure testing of SiC-coated graphite bend bars showed that the CNTD SiC was superior to other conventional SiC materials over the whole range of temperatures tested. Problems were encountered in attaining uniformity and repeatability of the material. All deposits tested showed a two-phase structure of Si and SiC. Highly variable compressive surface stresses were observed by XRD techniques. Attempts to develop a CNTD process for AlN were not successful. However, grain refinement and improvement in physical properties were achieved when AlN deposits were 'doped' with Si. The electrical and thermal properties of CVD AlN were comparable to other AlN materials. The IR transmittance characteristics were found to be inferior, possibly due to impurities in the deposit.
Author (GRA)

N82-18372# Atomic Energy Research Establishment, Harwell (England). Materials Development Div.
THE OXIDATION OF DILUTE IRON-SILICON ALLOYS ((Si) < OR = 1w/o) IN CARBON DIOXIDE
P. T. Moseley, G. Tappin, and J. C. Riviere Feb. 1981 14 p refs
(AD-A108328; AERE-R-10042; HL81/515) Avail: NTIS HC A03/MF A01 CSCL 11/6

The manner in which silicon, present as a minor alloy constituent, modifies the oxidation of iron in CO2/1% CO at 500 C has been studied. Increasing amounts of silicon progressively reduce the oxidation rate within the range (Si) = 0-1w/o and a variety of physical techniques have been used to examine oxidized specimens in pursuit of the origins of this beneficial influence. The scale forming on the alloys is composed of two layers in each of which iron is present as Fe3O4. The inner layer of scale contains silicon at approximately the same level (on a volume % basis) as the original metal while the outer scale appears to contain no silicon. The boundary between the two layers is also marked by an abrupt change in grain size and in texture of the Fe3O4. At the boundary between the alloy and the scale there develops a thin layer of nonferrous material in which the concentration of silicon is increased by more than an order of magnitude above that in the bulk alloy. This layer also includes a substantial accumulation of carbon which is thought to derive from carbon oxide gases which have penetrated to the base of the scale before taking part in the oxidation reaction. GRA

N82-18373# Battelle Columbus Labs., Ohio.
MECHANICAL-PROPERTY DATA CT 91-T7E69 ALUMINUM, POWDER METALLURGY PRODUCT
Sep. 1981 10 p refs
(Contract F33615-80-C-5168)
(AD-A108710) Avail: NTIS HC A02/MF A01 CSCL 11/6

CT 91-T7E69 aluminum alloy is a powder metallurgy product of Alcoa. The material was received as two 1-1/2 inch thick x 4-1/2 inch wide x 4 foot lengths. The CT 91 aluminum was received in the T7E69 condition. This temper was designed to have good static strength and fatigue resistance. Results of these tests show higher tensile, shear, and fatigue data as compared to the T7E70 temper while giving lower fracture toughness values. GRA

N82-18374# Illinois Univ. at Urbana-Champaign, Urbana. Dept. of Metallurgy and Mining Engineering.
THE EFFECT OF HYDROGEN ON THE SOLID SOLUTION STRENGTHENING AND SOFTENING OF NICKEL
J. Eastman, F. Heubaum, T. Matsumoto, and H. K. Birnbaum Nov. 1981 34 p refs
(Contract N00014-75-C-1012)
(AD-A108654) Avail: NTIS HC A03/MF A01 CSCL 11/6

The effects of hydrogen on the plastic deformation of nickel and nickel-carbon alloys were studied using plastic deformation techniques over a wide range of strain rates at about 300 K. The emphasis of the study was on the behavior at very low strains and low strain rates. Hydrogen was introduced as a solute element by quenching from a gaseous H2 atmosphere or by testing in a gaseous H2 atmosphere. The behavior of a number of different purities of nickel with hydrogen additions was examined. The most significant impurity element seemed to be C and this element was varied over a wide composition range by annealing in different atmospheres. Both solution softening and solution strengthening was observed depending on the amount of H in solution relative to the amount of C in solution. The nature of this solution softening is discussed. Author (GRA)

N82-18375# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Dept.
SHIPBOARD EXPOSURE TESTING Progress Report
E. J. Jankowsky and S. J. Ketcham 9 Sep. 1981 30 p refs
(AD-A108146; NADC-81075-60) Avail: NTIS HC A03/MF A01 CSCL 11/6

An effort is underway to correlate results of accelerated laboratory corrosion tests with actual shipboard exposure of aircraft materials. This report compares results of corrosion tests of a series of aluminum alloys with varying degrees of exfoliation resistance exposed on the flight decks of nuclear and conventional carriers. Results of exposure of laser hardening paints, water displacing paint, aluminum/aluminum oxide and graphite/epoxy composites are also described. Additionally, results of initial laboratory tests are given. Author (GRA)

N82-18376# Naval Research Lab., Washington, D. C. Structural Integrity Branch.
COMPARISON OF NOTCH-STRESS WITH STRAIN-CONTROLLED LOW CYCLE FATIGUE OF ALPHA-BETA TITANIUM ALLOYS Interim Report
J. M. Krafft and G. R. Yoder 4 Dec. 1981 13 p refs
(AD-A108548; NRL-MR-4697) Avail: NTIS HC A02/MF A01 CSCL 11/6

Prior studies of the present authors provided two different tests of low cycle fatigue endurance of the same set of titanium alloys. Strain controlled push-pull deformation of axial specimens covered crack initiation life of up to 1000 cycles. Notch stress controlled tensile load cycling extended the range to 1 million cycles. All of Ti-6Al-4V, the test materials varied in oxygen content and in effective grain size. The results could not be compared directly because of the disparity in the controlling variables; strain and stress excursions respectively. It is found that both kinds of data form a consistent set if the total stress excursion is used as a basis of comparison, except for cases of overly high notch loading. The earlier strain-controlled results were modeled by a cumulative cyclic creep strain criterion for crack initiation. This criterion appears to embrace also the notch stress results, thus providing a promising means for extrapolating fatigue data.
Author (GRA)

N82-18377# Naval Research Lab., Washington, D. C. Mechanics of Materials Branch.
EFFECTS OF MICROSTRUCTURE AND FREQUENCY ON CORROSION-FATIGUE CRACK GROWTH IN Ti-8Al-1Mo-1V AND Ti-6Al-4V Final Report
G. R. Yoder, L. A. Cooley, and T. W. Crooker 8 Dec. 1981 18 p refs
(RR0220148)
(AD-A108361; NRL-MR-4678) Avail: NTIS HC A02/MF A01 CSCL 11/6

Fatigue crack growth studies were conducted on Ti-8Al-1Mo-1V and Ti-6Al-4V alloys in 3.5% NaCl aqueous solution. Each alloy was studied in two microstructural conditions and at two cyclic frequencies. The Ti-8Al-1Mo-1V was heat treated to produce a fine grained duplex anneal microstructure and a coarse grained Widmanstatten microstructure resulting from a beta anneal. The two microstructural conditions for the Ti-6Al-4V were an as received mill anneal and a beta anneal. The two cyclic frequencies were 01. and 5.0 Hz. Crack growth rates in air were found to be significantly reduced as a result of microstructural modifications associated with the beta anneal heat treatment. Although the salt water environment significantly accelerated crack growth rates for both alloys, this same ranking of fatigue crack growth resistance persisted in the present study. Both mirostructures of the Ti-6Al-4V alloy exhibited a frequency crossover effect. Out of plane cracking was observed in both alloys in the beta annealed condition. The effects of varying degrees of out of plane cracking on apparent crack growth rates are noted.
Author (GRA)

N82-18378# Delaware Univ., Newark.
RADIATION EFFECTS IN AMORPHOUS METALLIC ALLOYS
Progress Report, 1 Feb. 1981 - 31 Jan. 1982
R. B. Murray, J. J. Kramer, and D. G. Onn Sep. 1981 30 p refs
(Contract DE-AC02-80ER-10571)
(DE82-001603; DOE/ET-10571/4) Avail: NTIS HC A03/MF A01

The possible role of phosphorus segregation in radiation-induced changes in the magnetic properties of amorphous metallic alloys in the series Fe/sub x/Ni/sub 80-x/P/sub Y/B/sub 20-y/ (20 less than or equal to x less than or equal to 40; 0 less than or equal to y less than or equal to 14) was investigated. It is concluded that phosphorus segregation is, at most, only partially responsible for the observed increase in Curie temperature following irradiation, whereas phosphorus segregation may be largely responsible for the introduction of X-ray scattering centers by irradiation. Static domain studies, performed using the Bitter technique, suggest that both irradiation and annealing result in structural rearrangement, i.e., stress-relief anneal. TEM studies indicate no change in the amorphous structure before and after irradiation. The electrical resistivity of irradiated samples shows a temperature dependence at low temperatures somewhat different from that of virgin material. DOE

N82-18379# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Lab.
EFFECT OF THERMAL CYCLING ON THE MOVEMENT OF THE ALPHA Zr/ALPHA Zr-2.5 WT PERCENT Nb ALLOY
B. Cox and V. C. Ling May 1980 27 p refs
(AECL-6883) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A piece of CW Zr-2.5 wt% Nb alloy pressure tube was hydrided at one end in 40 g/L LiOH solution at 573 K (after nickel-plating that end). The result was a solid hydride layer 0.6 mm thick plus approximately 130 ppm hydrogen in the core under the nickel plate. Thermal cycling under conditions similar to those likely to be experienced during a reactor trip did not cause any significant movement of the (-)+hydride/(-) phase boundary along the tube for up to 2688 cycles from 573 to 523 K. Supercharging of the core was observed in the nickel-plated area. Conclusions concerning the origin of the hydrogen in the nickel-plated area, and the factors controlling the supercharging process are given. DOE

N82-18380# Central Inst. for Industrial Research, Blindern (Norway).
CHARACTERIZATION OF THE MICROSTRUCTURE OF STABILIZED ZIRCONIA USED ON DIESEL-ENGINE COMPONENTS
Ingard Kvernes 1980 22 p ref
(Contract DE-AC03-79ET-15324)
(DE81-029303; DOE/ET-15324/T2) Avail: NTIS HC A02/MF A01

Stabilized ZrO2 coatings have lowered the metal temperature and protected the coated parts against corrosion and thermal load. A coated value compared to an uncoated one shows upt to 500 C less metal temperature at normal load. The tested piston (3000 h) does not show any areas of ceramic coating loss at all, but the valve shows loss of a part of the ceramic coating in an area in the center of the valve plate after 500 h. This area corresponds to the diameter of the valve stem and may be due to the temperature distribution. Metallographic examination showed no base metal deterioration. This demonstrated that local coating loss will not necessarily result in damage to metal components. Results have shown that consideration should be given to improve the spraying technique, tailored coating and graded layers regarding temperature stresses in the base metal. It is also believed that a treatment after the coating process will be of advantage. DOE

N82-18381# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany). Abt. Metallische.
REPLACING MILLED DRAWN ALUMINUM PIECES BY PRECISION FORGED ONES [ERSATZ VON FRAESTEILEN AUS GERECKTEN ALUMINIUMPLATTEN DURCH GENAUSCHMIEDETEILE]
K.-H. Rendigs 1981 52 p refs In GERMAN Presented at DGM Hauptversammlung, Baden-Baden, West Germany, 9-12 Jun. 1981
(V-2158) Avail: NTIS HC A04/MF A01

The application of semifinished precision ground plates in precision forging construction is discussed. The following tests were performed: precipitate sample tests; sliding angles and mechanical properties; hardware; spring supports; structural member tests of ege beams; static structural tests; a comparison of the qualitative and aerodynamic tests. Transl. by E.A.K.

N82-18382# European Space Agency, Paris (France).
THE INFLUENCE OF COMPOSITION ON THE STRUCTURE AND MECHANICAL PROPERTIES OF THE COMPOUND NiAl
Michel-Jean Lequeux Nov. 1981 205 p refs Transl. into ENGLISH of "Influence de l'Ecart a la Stoechiometrie sur la Structure et les Proprietes Mecanique du Compose NiAl", Rept. ONERA-Publ-1980-3 ONERA, Paris 1981 Original report in FRENCH previously announced as N81-32559
(ESA-TT-700; ONERA-Publ-1980-3) Avail: NTIS HC A10/MF A01

Nickel vacancies on the aluminum rich side and substitutional Ni atoms on the nickel rich side are efficient strengtheners of the NiAl compound. Results show that above 54% Ni the substitutional Ni atoms can precipitate leading to a Ni2Al phase. An hexagonal structure with omega type distortion is discussed for this ordered phase. The critical temperature for ordering of Ni2Al is around 920 K. No precipitation is obtained between 50% and 54% Ni. In this range of compositions the yield stress of polycrystals was measured for temperatures going from 300 to 1250 K. Three stages are found in the sigma-T curves and discussed. Author (ESA)

N82-18383# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
INVESTIGATION OF A GALVANIC SEPARATED ALUMINUM COATING AS SURFACE LAYER PROTECTION FOR HIGH STRENGTH STEEL [UNTERSUCHUNG GALVANISCH ABGESCHIEDENER ALUMINIUMUEBERZUEGE ALS OBERFLAECHENSCHUTZ FUER HOCHFESTE STAEHLE]
W. Wittich, R. Suchentrunk, and H. Kellerer 1976 7 p refs Reprint from Metall Intern. Zeitschr. fuer Tech. u Wirschi, V. 10,30, 1976 p 943-947 In GERMAN; ENGLISH summary
(NBB-BB-486-0) Avail: NTIS HC A02/MF A01

The various possibilities for the electrodeposition of aluminum are discussed and the optimal process is selected high strength steel specimens are coated with aluminum by this process. Corrosion tests show that galvanic aluminum has probably good suitability for the surface protection of steels. J.M.S.

N82-18384# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Beitriebsbereich.
FULLY GALVANIC FABRICATION OF COMPLEX FORMS [VOLLGALVANISCHE HERSTELLUNG KOMPLIZIERTER FORMEN]
O. Tuscher and R. Suchentrunk 1981 6 p Reprint from Metalloberflaeche; v. 32, no. 2, 1978 In GERMAN Presented at 15th DGLR Jahrestagung, Bad Kissingen, West Germany, 28-30 Sep. 1977
(MBB-BB-489-0) Avail: NTIS HC A02/MF A01

The fabrication of complicated self supporting structures, by depositing thick galvanic copper or nickel thin films on a premolded electroplated core is discussed. The galvanic technique needs exact duplication, especially when producing high frequencies, when the necessary waveguides and emission horns are needed. By employing proper screening extremely light weight structure are produced. Proper techniques are demonstrated by waveguide antennas. True reproduction at low weight is shown while only attached on one side since no shifting of focal point is allowed. Transl. by E.A.K.

N82-18385# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
HIGH TEMPERATURE COATINGS FOR GAS TURBINES: A REVIEW
A. J. A. Mom Jan. 1981 60 p refs In DUTCH; ENGLISH summary Presented at Corrosiedag 1980, Ede, Netherlands, 23 Oct. 1980

(NLR-MP-81003-U) Avail: NTIS HC A04/MF A01

The use of oxidation and corrosion resistant coatings in high temperature sections of aircraft gas turbines, marine gas turbines, and industrial gas turbines is discussed. The present state of the art and expected developments are pointed out. Different types of coatings (diffusion coatings, metallic overlays and ceramic coatings) and their properties are considered. Different techniques for the application of coatings are reviewed. In particular, the buildup, composition and structure of Al diffusion coatings and metallic overlays are described, including the effect of structure and composition on mechanical properties. Selection criteria for coatings in gas turbines are reevaluated, stressing service life, while presently available commercial coatings are assessed.
Author (ESA)

N82-18386# Centre Technique des Industries Mecaniques, Senlis (France).
FRICTION COEFFICIENT OF FLAME SPREAD MATERIALS Final Report [FROTTEMENT DE MATERIAUX PROJETES A CHAUD]
F. Mortier and B. Bourgouin May 1981 47 p In FRENCH
(CETIM-12-DO-71) Avail: NTIS HC A03/MF A01

The friction behavior of various flame sprayed coatings was determined in order to rationalize the choice of coating material vis a vis application. The coating materials tested were divided into three categories: metals and metallic alloys (NiAl, Mo, CoCrBW, NiCrBSi); metallic carbides (CW, TiC); and oxides ($CrZO3$, $AlZO3 + SiOZ$). A wheel on plane tribometer was used. Two surface finishing techniques were employed: diamond wheel grinding and a superfinishing technique. Besides a tabular account of the friction properties of the different coatings, results are shown which highlight the superfinishing process. Author (ESA)

N82-18387# Centre Technique des Industries Mecaniques, Senlis (France).
CHARACTERIZING HEAT TREATMENT INSTALLATIONS Final Report [CONTROLE DES INSTALLATIONS DE TRAITEMENTS THEMIQUES]
F. Rohart and A. Brucele Apr. 1981 177 p refs In FRENCH
(CETIM-12-G-199) Avail: NTIS HC A09/MF A01

The CETIM heat treatment facility is presented and its application in materials science is discussed. Problems encountered in the use of the installation are cited and remedies are proposed. Heat treatment can be either superficial (cementation, nitriding) or in-depth (annealing, tempering quenching, isothermal treatment). The equipment and furnaces are described. Studies reveal that the principal causes of uncertainty in heat treatment tests are insufficient temperature control of materials, reactivity between the environment and test specimens, and poor understanding of the laws governing heating and cooling of specimens. Author (ESA)

N82-18388 Illinois Inst. of Tech., Chicago.
TEXTURE DEVELOPMENTS ASSOCIATED WITH ABNORMAL GRAIN GROWTH IN LOW CARBON STEEL SHEET Ph.D. Thesis
Chin-Fong Chang 1981 298 p
Avail: Univ. Microfilms Order No. 8200412

The phenomenon of abnormal grain growth in a low carbon aluminum killed steel sheet was investigated with special reference to the development of texture. The standard treatment sequences included: (1) hot band rapidly heated to 704 C and annealed for 5 hours to give AlN precipitation; (2) cold rolled 70%; (3) rapidly heated to 871 C and decarburized for 2 1/2 hours in a 90% moist argon-10% hydrogen atmosphere; (4) annealed at 871 C for 2-20 hours in a 62% argon-35% hydrogen atmosphere. The influence of a range of variables was investigated, the nature of the surface layer, the dew point, the decarburization temperature, and the heating rate. The surface layer of the hot band with finer grain size has been found to be critical to the development of abnormal grain growth. The growth kinetics show that the development of the (110) 001 texture is not a nucleation effect but results from the preferential growth characteristics of this orientation. The kinetic analysis also indicates that (110) 001 grains have a higher mobility than non (110) 001 grains, and that this appears to be associated with the pre-exponential term in the mobility equation. Dissert. Abstr.

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-18389* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARBORANYLCYCLOTRIPHOSPHAZENES AND THEIR POLYMERS Patent
Harry R. Allcock (Pennsylvania State Univ., University Park), John P. OBrien (Pennsylvania State Univ., University Park), Angelo G. Scopelianos (Pennsylvania State Univ., University Park), and Larry L. Fewell, inventors (to NASA) (Pennsylvania State Univ., University Park) Issued 8 Sep. 1981 4 p Filed 12 Mar. 1980 Supersedes N80-21533 (18 - 12, p 1552) Sponsored by NASA
(NASA-Case-ARC-11176-1; US-Patent-4,288,585; US-Patent-Appl-SN-129799; US-Patent-Class-528-4; US-Patent-Class-528-168; US-Patent-CLass-528-6; US-Patent-Class-528-7; US-Patent-Class-568-2; US-Patent-Class-568-4; US-Patent-Class-568-5; US-Patent-Class-528-399) Avail: US Patent and Trademark Office CSCL 07C

Carboranyl-substituted polyphosphazenes are prepared by heat polymerizing a carboranyl halocyclophosphazene at 250 C for about 120 hours in the absence of oxygen and moisture. The cyclophosphazene is obtained by allowing a lithium carborane, e.g., the reaction product of methyl-o-carborane with n-butyllithium in ethyl ether, to react with e.g., hexachlorocyclotriphosphazene at ambient temperatures and in anhydrous conditions. For greater stability in the presence of moisture, the chlorine substituents of the polymer are then replaced by aryloxy or alkoxy groups, such as $CF3CH2O$. The new substantially inorganic polymers are thermally stable materials which produce a high char yield when exposed to extreme temperatures, and can thus serve to insulate less heat and fire resistant substances.
Official Gazette of the U.S. Patent and Trademark Office

N82-18390*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
REUSABLE THERMAL CYCLING CLAMP Patent Application
William J. Debnam, Jr., Archibald L. Fripp, and Roger K. Crouch, inventors (to NASA) Filed 17 Nov. 1981 10 p
(NASA-Case-LAR-12868-1; US-Patent-Appl-SN-322321) Avail: NTIS HC A02/MF A01 CSCL 11A

A reusable metal clamp was developed for retaining a fused quartz ampoule during temperature cycling in the range of 20 C to 1000 C. A compressible graphite foil with a high radial coefficient of thermal expansion is interposed between the fused quartz ampoule and the metal clamp to maintain a snug fit between these components at all temperature levels in the cycle. NASA

N82-18391# Technische Hogeschool, Delft (Netherlands).
BIREFRINGENCE AND STRESS IN POLYMER MELTS UNDER SHEAR AND EXTENSION Ph.D. Thesis
J. A. vanAken 10 Sep. 1981 88 p refs
Avail: NTIS HC A05/MF A01

The investigation of the shear flow behavior of polymer melts using the flow birefringence technique is described. The apparatus and the rheological equations employed are described. J.D.H.

N82-18392# Laboratory for Electronic Development of the Armed Forces, Oegstgeest (Netherlands).
MEASUREMENT OF THE DIELECTRIC CONSTANT OF CERAMIC $Al2O3$ SUBSTRATES [METING VAN DE DIELECTRISCHE CONSTANTE VAN KERAMISCHE - $Al2O3$ - SUBSTRATEN]
J. vanStaaden and J. H. M. Strijbos 9 May 1980 27 p refs In DUTCH
(LEOK-TR-1980-04; TDCK-75059) Avail: NTIS HC A03/MF A01

A method to determine the dielectric constant of ceramic $Al2O3$ substrate is described. Measurements are based on the cavity resonance. Fringing is subdivided in dispersion and final

effects in which dispersion affects the dielectric constant more than the final effect. A measuring method based on closed cavity resonance measurements is presented. The dielectric constant in open cavity resonance is also determined. Transl. by E.A.K.

N82-18393# Pennsylvania Univ., Philadelphia. Dept. of Physics.
PHOTOEXCITATIONS IN POLYACETYLENE Interim Technical Report
L. Lauchland, S. Etemad, T.-C. Chung, H. J. Heeger, and Alan G. MacDiarmid 11 Nov. 1981 46 p refs Submitted for publication
(Contract N00014-81-K-0648)
(AD-A107831; LSMR-TR-81-12) Avail: NTIS HC A03/MF A01 CSCL 07/5

The results of experimental studies of photoluminescence and photoconductivity in cis- and trans-(CH)x are presented. For cis-(CH)x, we find recombination luminescence in the scattered light spectrum at 1.9 eV, near the interband absorption edge. The luminescence turns on sharply for excitation energies greater than 2.05 eV, implying a Stokes shift of 0.15 eV. Studies of the temperature dependence (T more than or equal to 7 K) show no loss of luminescence intensity even at temperatures as high as 300 K. Isomerization of the same sample quenches the luminescence; we find no indication of luminescence near the interband absorption edge of trans-(CH)x even at temperatures as low as 7K. These results are discussed in the context of parallel phototransport studies. The quenching of the luminescence upon cis-trans isomerization is concurrent with the appearance of a large photoconductive response. The photoconductivity in trans-(CH)x has a threshold at 1.0 eV, well below the interband absorption edge at 1.5 eV, implying the presence of states deep inside the gap. The observation of luminescence in cis-(CH)x, but not in trans-(CH)x; and the observation of photoconductivity in trans-(CH)x, but not in cis-(CH)x provide confirmation of the proposal that solitons are the photogenerated carriers. In trans-(CH)x, the degenerate ground state leads to free soliton excitations, absence of band edge luminescence, and photoconductivity. In cis-(CH)x the non-degenerate ground state leads to confinement of the photogenerated carriers, absence of photoconductivity, and to the observed recombination luminescence.
Author (GRA)

N82-18394# Advanced Mechanical Technology, Inc., Newton, Mass.
HARD-ON-HARD (CERAMIC) LONG-LIFE SEALS AND RIDERS FOR CRYOGENIC COOLERS Final Report, Jun. 1979 - Oct. 1980
Forest J. Carignan and Alan I. West Wright-Patterson AFB, Ohio AFWAL Aug. 1981 63 p refs
(Contract F33615-79-C-5029; AF Proj. 2402)
(AD-A108646; AFWAL-TR-81-4060) Avail: NTIS HC A04/MF A01 CSCL 11/2

A reciprocating pin-on-plate apparatus was designed and constructed for the testing of friction and wear characteristics of ceramic materials. The machine was specifically constructed to conduct tests at cryogenic temperatures in a pressurized (300 psig maximum) helium atmosphere. Cryogenic testing was not accomplished but 17 ceramic materials were screened at room temperature in 15 psig helium. As a result of the screening tests, the materials were rank ordered according to their wear, and friction coefficients were tabulated. Several ceramics performed as well or better than fluorogold, a currently used seal material. Recommendations were made concerning additional materials to be tested and the materials characterizations needed for data analysis. Author (GRA)

N82-18395# Air Force Weapons Lab., Kirtland AFB, N. Mex.
SURFACE STATISTICS INVESTIGATIONS Final Report
Richard A. House, II Oct. 1981 45 p refs
(AD-A108234; AFWL-TR-81-40) Avail: NTIS HC A03/MF A01 CSCL 11/2

Results are reported of two investigations on surface structural properties of optical glasses. One project dealt with surface profiling analyses of a set of fused silica samples which had previously been laser damage tested. The other project had to do with the roughening of polished quartz and BK7 glasses by extended periods of ultrasonic cleaning. Author (GRA)

N82-18396# Johns Hopkins Univ., Baltimore, Md.
QUANTUM CHEMICAL INVESTIGATIONS OF THE MECHANISM OF CATIONIC POLYMERIZATION AND THEORETICAL PREDICTION OF CRYSTAL DENSITIES AND DECOMPOSITION PATHWAYS OF ENERGETIC MOLECULES Annual Summary Report, 1 Oct. 1980 - 30 Sep. 1981
Joyce J. Kaufman 15 Oct. 1981 61 p
(Contract N00014-80-C-0003)
(AD-A108520; TR-2) Avail: NTIS HC A04/MF A01 CSCL 20/10

Quantum chemical calculations on the large molecules are made with programs which also incorporate several desirable options for calculation on large molecules. There are two-major steps in the polymerization of cyclic ethers, the initiation step proportional to basicity and ring strain of the cyclic ether and the propagation step, attributed to the electrophilicity of the propagating carbocation. Electrostatic molecular potential contour maps generated from ab-initio MODPOT/VRDDO calculation basicities of these ethers and their propensity to undergo cationic polymerization. Calculations are made on the cyclic ethers and on the proton attack on these ethers to get a coherent overview of the initation problem. These maps also indicate good copolymer coordinates. These maps form a semiquantitative guide to the ease of polymerizability of energetic cyclic ethers. GRA

N82-18397# Wisconsin Univ. - Madison. Dept. of Chemical Engineering.
PROPERTIES OF MULTIPHASE POLYURETHANE SYSTEMS Final Report, 1 Jul. 1980 - 30 Jun. 1981
Stuart L. Cooper Aug. 1981 42 p
(Contract N00019-80-C-0367)
(AD-A108519) Avail: NTIS HC A03/MF A01 CSCL 11/9

The influence of morphology on the structure-property relationships of polyvinylchloride-polyurethane blend systems was studied. Studies on blends of a segmented polyether polyurethane ET-38-1 with PVC were carried out utilizing differential scanning calorimetry (DSC), Rheovibron, stress-strain, infrared peak positions studies, and infrared dichroism experiments. As determined from DSC and Rheovibron data, THF-dioxane solution casting and melt processed samples are incompatible while THF solution casting produced a partially compatible polyurethane-PVC blend. However, similar uniaxial stress-strain data on all three series of samples indicate substantial polyether (soft segment of polyurethane) plasticization effect upon PVC, and therefore all of the blends can be considered as mechanically compatible. This produces useful blend systems of satisfactory mechanical properties with the PVC acting as a polyurethane stiffening agent. Such blends also exhibit improved flammability characteristics which are inherent to the PVC component. This is especially valuable in foamed elastomer or plastic applications. GRA

N82-18398# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
IMPROVED MOISTURE RESISTANCE OF FIBER-REINFORCED PLASTIC Final Report, 1 Jul. 1978 - 30 Sep. 1981
Jack L. Koenig Dec. 1981 186 p refs
(Contract DAAG29-80-C-0236; Grant DAAG29-78-G-0148)
(AD-A109190; ARO-14740.4-MS) Avail: NTIS HC A09/MF A01 CSCL 11/9

The text of seven papers is included: (1) Improved Moisture Resistance of Fiber-Reinforced Plastic (An Introduction); (2) The Structure of Aminofunctional Silane Coupling Agents: Part 1: gamma-Aminopropyltriethoxysilane and its Analogues; (3) Spectroscopic Characterization of the Matrix-Silane Coupling Agent Interface in Fiber-Reinforced Composites; (4) Interfacial Strength Studies of Fiber-Reinforced Composites; (5) Comparison of Primary and Secondary Aminosilane Coupling Agents in Anhydride-Cured Epoxy Fiberglass Composites; (6) Chemical Reactions Occurring at the Interface of Epoxy Matrix and Aminosilane Coupling Agents in Fiber-Reinforced Composites; (7) Magic-Angle Cross Polarization Carbon-13 NMR Study of Aminosilane Coupling Agents on Silica Surfaces. GRA

N82-18399# European Space Agency, Paris (France).
DETERMINATION OF THE HIGH TEMPERATURE STRENGTH OF CERAMIC. DISCUSSION OF TESTING TECHNIQUES: FLEXURAL AND TENSILE TESTS, CREEP

TESTS WITH FLEXURAL AND TENSILE LOAD
Werner Gebhard Oct. 1981 24 p refs Transl. into ENGLISH from "Die Ermittlung der Warmfestigkeit keramischer Werkstoffe. Diskussion der Pruefmethoden: Biege- u. Zugfestigkeit, Kriechen unter Biege- u. Zugbelastung", Rept. DFVLR-Mitt-81-03 DFVLR, Cologne, Jan. 1981
(ESA-TT-716; DFVLR-Mitt-81-03) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 8,90

High temperature strength of ceramic materials was determined within the service temperature range of an automobile gas turbine. For the use of ceramics as construction materials in gas turbine assemblies, results for flexural and tensile behavior are of varying consequence. In particular for turbine blades, centrifugal force at the blade root entrains forces that can cause large mechanical strain. Test apparatus is described, and test philosophy for the characterization of creep is discussed. The stress exponent n of secondary creep rate is specified from flexural and tensile creep tests, and the n data of different ceramic materials is presented. Author (ESA)

N82-18400# Bureau of Mines, Tuscaloosa, Ala.
HIGH-TEMPERATURE CORROSION RESISTANCE OF CERAMIC MATERIALS
T. A. Clancy 1981 37 p refs
(PB82-104399; BM-IC-8843) Avail: NTIS HC A03/MF A01 CSCL 11B

The Bureau of Mines reviewed and assessed the literature on corrosion resistance of ceramic materials. Corrosive conditions were categorized as: (1) acids and aqueous solutions, (2) glass and slag/metal melts, and (3) gases. Information on the corrosion resistance of ceramic materials, generally, is disseminated by many sources, each of which is interested in specific corrosive environments. Based on this survey, it was noted that (1) the development of standardized tests is needed to study solution-type corrosion of ceramics, (2) slag/melt corrosion data are the most comprehensive of the available data, and (3) better definition of corrosion mechanisms in gaseous environments is needed. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-18401* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
USE OF GLOW DISCHARGE IN FLUIDIZED BEDS Patent
Theodore Wydeven (San Jose State Univ., Calif), Peter C. Wood (San Jose State Univ., Calif.), Edward V. Ballou (San Jose State Univ., Calif.), and Leroy A. Spitze, inventor (to NASA) (San Jose State Univ., Calif.) Issued 1 Dec. 1981 6 p Filed 26 Oct. 1979 Supersedes N80-11326 (18 - 02, p 0185) Sponsored by NASA
(NASA-Case-ARC-11245-1; US-Patent-4,303,961; US-Patent-Appl-SN-088663; US-Patent-Class-361-230; US-Patent-Class-239-690; US-Patent-Class-361-226) Avail: US Patent and Trademark Office CSCL 21D

Static charges and agglomerization of particles in a fluidized bed systems are minimized by maintaining in at least part of the bed a radio frequency glow discharge. This approach is eminently suitable for processes in which the conventional charge removing agents, i.e., moisture or conductive particle coatings, cannot be used. The technique is applied here to the disproportionation of calcium peroxide diperoxyhydrate to ield calcium superoxide, an exceptionally water and heat sensitive reaction.
Official Gazette of the U.S. Patent and Trademark Office

N82-18402*# SRI International Corp., Menlo Park, Calif.
OXIDATION AND FORMATION OF DEPOSIT PRECURSORS IN HYDROCARBON FUELS Final Report
S. E. Buttrill, Jr., Frank R. Mayo, Bosco Lan, G. A. St.John, and David Dulin Jan. 1982 26 p refs
(Contract NAS3-22510)
(NASA-CR-165534; PYU-2115) Avail: NTIS HC A03/MF A01 CSCL 21D

A practical fuel, home heating oil no. 2(Fuel C), and the pure hydrocarbon, n-dodecane, were subjected to mild oxidation at 130 C and the resulting oxygenated reaction products, deposit precursors, were analyzed using field ionization mass spectrometry. Results for fuel C indicated that, as oxidation was initially extended, certain oxygenated reaction products of increasing molecular weights in the form of monomers, dimers and some trimers were produced. Further oxidation time increase resulted in further increase in monomers but a marked decrease in dimers and trimers. This suggests that these larger molecular weight products have proceeded to form deposit and separated from the fuel mixture. Results for a dodecane indicated that yields for dimers and trimers were very low. Dimers were produced as a result of interaction between oxygenated products with each other rather than with another fuel molecule. This occurred even though fuel molecule concentration was 50 times, or more greater than that for these oxygenated reaction products. Author

N82-18403# Naval Surface Weapons Center, White Oak, Md.
DESCRIPTION OF HOT SPOTS ASSOCIATED WITH LOCALIZED SHEAR ZONES IN IMPACT TESTS Research Report, Oct. 1979 - Sep. 1980
C. Stephen Coffey and Ronald W. Armstron 21 Oct. 1981 22 p refs
(AD-A108542; NSWC/TR-80-499) Avail: NTIS HC A02/MF A01 CSCL 19/1

A heat sensitive film technique has been employed to give spatial resolution to the observation of 'hot spots' in the impact deformation of soft ionic or molecular crystals and in crystal-filled polymer composites. The temperature of these 'hot spots' is estimated to exceed 250 C for even modest impact loads. The heating is interpreted to depend on local shear deformation. The rise in temperature associated with the movement of a number of equally-spaced dislocations is reexamined. An additional multiplicative effect for the temperature rise due to the dislocation number is obtained if the dislocations are released as a pile-up avalanche from an internal obstacle. This rise in temperature carries over to the association of localized heating of 'hot spots' with cracking within polymers because of the equivalence in the continuum approximation of a dislocation pile-up and a physical crack. Two reasons for the heating effect being especially important at cracking sites are that they are typified by the largest internal concentrations of stress which the material can bear before local fracture occurs, and, in so doing, the new crack surfaces supply a ready 'sink' for the dissipation of the internal energies at the tips of shear zones. GRA

N82-18404# Naval Weapons Center, China Lake, Calif.
DECOMPOSITION AND INTERACTION OF PROPELLANT INGREDIENTS Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981
K. J. Kraeutle and T. L. Boggs 30 Sep. 1981 7 p refs
(AD-A108135) Avail: NTIS HC A02/MF A01 CSCL 21/9

The program utilizes a wide variety of experimental methods as well as theoretical studies in specific areas such as burn rate modeling. These methods have been well documented in numerous presentations, publications, and patents. They allow the study of catalyzed and uncatalyzed decomposition of propellant oxidizers, binders, and metal fuels, and the evaluation of combustion characteristics, combustion performance, and combustion stability of experimental and production lot propellants. Where required, established test methods are modified or new methods are developed to meet specific needs such as in particle size analysis or ingredient modification. In-house or commercial analytical capabilities are employed whenever feasible or promising. The interpretation of results is facilitated by limiting the number of sample and test parameters as much as possible and by rigorous control of test variables. In the process, new options for tailoring of propellant combustion behavior, new propellant systems, and quality control of ingredients are evolved. Author (GRA)

N82-18405# Societe Europeenne de Propulsion, Bordeaux (France). Div. Structures et Controle Thermique.
EVALUATION OF A THERMAL RESPONSE TEST FOR ELECTROPYROTECHNICAL DEVICES: SUMMARY [EVALUATION DE L'ESSAI DE REPONSE THERMIQUE DES

DISPOSITIFS ELECTROPYROTECHNIQUES: RAPPORT DE SYNTHESES DES TRAVAUX]
P. Thebault Paris ESA 20 Jan. 1981 152 p refs In FRENCH Original contains color illustrations
(Contract ESTEC-3380/77)
(TP-15225/80; ESA-CR(P)-1467) Avail: NTIS HC A08/MF A01

The testing of electroexplosive devices, used for firing propellants, was investigated. Theory reveals the possibility of characterizing thermal response by two parameters relative to the heat transfer coefficient of the filament/propellant contact region and calorific capacity of the pyrotechnical interface. An electronic test apparatus was built which delivers an impulse current, rectangular waveform between 0.5 and 2 A of variable duration from 1 to 89 msec. Using the apparatus, experiments were carried out with normal and known-to-be defective initiators. Results show that the apparatus is suitable for measuring the theoretically identified parameters and that the test method is valid. Author (ESA)

N82-18406# Dynecology, Inc., Harrison, N.Y.
ADAPTATION OF THE SIMPLEX GASIFICATION PROCESS TO THE COCONVERSION OF MUNICIPAL SOLID WASTE AND SEWAGE SLUDGE
J. C. Arbo, D. P. Glaser, M. A. Lipowicz, R. B. Schulz, and J. L. Spencer Apr. 1981 54 p Sponsored in part by EPA
(PB82-112418; NYSERDA-81-6) Avail: NTIS HC A04/MF A01 CSCL 21D

The combining of coal with biomass and sewage sludge in varying ratios to form simplex briquettes to be fed into gasifiers was examined. The use of biomass sewage sludge and municipal solid wastes permit the use of Eastern-caking coals in commercial medium Btu gasifiers. The results found that many of the 225 experimental briquette formulations meet required structural integrity prevent the clumping and fusing that have hindered effective gasification of this type of coal; and meet storage criteria. The briquettes developed, if commercially available, could convert an urban disposal problem into an energy resource permitting the use of less expensive and more readily available Eastern coal. GRA

N82-18407# Gilbert (Glen A.) and Associates, Inc., Reading, Pa.
COMPARISON OF COAL BASED SYSTEMS: MEDIUM-BTU GAS VERSUS SNG FOR INDUSTRIAL APPLICATIONS Final Report
Michael D. Peterik 1 May 1981 202 p refs
(Contract GRI-5014-310-0195)
(PB82-117383; GRI-80/0056) Avail: NTIS HC A10/MF A01 CSCL 21D

Production and total system economics of fuel gas from coal for industrial use were analyzed. It was found that low-Btu gas offers industry certain cost advantages over higher heat content fuel gases in specific applications, but that its use will be characterized by small scale on-site systems. Intermediate Btu gas (IBG), on the other hand, offers an incentive for gas industry involvement because of potential cost reduction to industry through a regional, centralized, utility owned system. Synthetic natural gas costs, benefiting from economics of scale and plant siting, offer industry the lowest cost alternative for the majority of systems studied. Author (GRA)

N82-18408# National Center for Resource Recovery, Washington, D. C.
DENSIFICATION OF REFUSE-DERIVED FUELS: PREPARATION, PROPERTIES AND SYSTEMS FOR SMALL COMMUNITIES Final Report
Jay Campbell and Marc L. Renard Sep. 1981 163 p refs
(Grant EPA-R-804150)
(PB82-103904; EPA-600/2-81-188) Avail: NTIS HC A08/MF A01 CSCL 21D

Densified refuse derived fuel (d-RDF) is produced by compacting refuse derived fuel into agglomerated pieces sufficiently cohesive to sustain storage and handling. The use of this d-RDF product as a substitute for coal in spreader stroke boilers is a developing resource recovery alternative. The operation, performance and product characteristics of a waste shredding and densification subsystem for production of d-RDF from air classified light fraction is investigated and a technical and economic evaluation of d-RDF facilities for small communities is presented. GRA

N82-18409# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
STUDIES RELATED TO THE DEEP EARTH GAS Final Report, Sep. 1979 - Dec. 1980
Thomas Gold, Elizabeth Bilson, and Steven Soter 8 May 1981 40 p refs
(GRI Proj. 5014-363-0205)
(PB82-103821; GRI-80/0066) Avail: NTIS HC A03/MF A01 CSCL 21D

The origin of terrestrial hydrocarbons, principally methane and petroleum and the importance of the ablogenic methane component in natural gas, which originates at much greater depth than the organic methane, from meteoritic carbonaceous matter accumulated in the mantle at the time of the Earth's formation. Experiments include: (1) inverse cracking designed to study the conditions for methane addition to petroleum hydrocarbons; (2) isotope analysis of methane was samples collected in geopressured wells, tectonically active regions, and seeps of possibly ablogenic origin; and (3) construction and testing of a ground gas pressure monitoring unit to be used for the investigation of the relationship of Earth outgassing and tectonic processes. GRA

N82-18410# California Univ., Berkeley. Dept. of Mechanical Engineering.
FUNDAMENTAL CONSIDERATIONS FOR PREPARING DENSIFIED REFUSE DERIVED FUEL Final Report
George J. Trezek, George M. Savage, and Daniel B. Jones Sep. 1981 59 p refs
(Grant EPA-R-805414)
(PB82-101668; EPA-600/2-81-180) Avail: NTIS HC A04/MF A01 CSCL 21D

A series of pilot scale tests were conducted to determine the effects of various parameters on the densification of refuse derived fuel. The experiments included a series of bench scale experiments involving a single die arrangement, as well as larger scale studies in which a commercial pellet mill was used. The bench scale tests (tests in which the pellets were individually formed), were conducted both to provide data needed for an analysis of the basis dynamics of pellet formation and as an aid in the interpretation of results obtained with the pellet mill. The energy required to overcome die friction was studied independently of the energy consumed in material deformation and compression. The specific effects of die length, diameter, and taper were determined. GRA

N82-18411# Midwest Research Inst., Kansas City, Mo.
COMPARATIVE STUDY OF AIR CLASSIFIERS Final Report
Vern Hopkins, Bruce W. Simister, and George M. Savage (Cal Recovery Systems, Inc.) Sep. 1981 294 p refs Sponsored in part by Naval Civil Engineering Labs.
(Contract EPA-68-03-2730)
(PB82-106121; EPA-600/2-81-221) Avail: NTIS HC A13/MF A01 CSCL 21D

The results of field tests of seven different air classifier systems are presented. The systems are compared in regard to their capacity to handle refuse and separate it into a heavy fraction and a light fuel fraction; their ability to concentrate lights in the light fraction and heavies in the heavies fraction as compared to the infeed; the quality of the light fraction for refuse derived fuel; the yield of combustibles from the infeed that are collected in the light fraction; the consumption of air required to handle a given quantity of infeed; and costs (engineering, capital, and operation and maintenance) per unit weight of refuse infeed at design capacity. Tests were run on each classifier at three airflow rates and at 5 to 10 refuse infeed rates. Procedures used to run these tests are given, and treatment of samples taken from light and heavy fraction streams is outlined. GRA

N82-18412# Environmental Protection Agency, Ann Arbor, Mich. Control Technology Assessment and Characterization Branch.
GASOLINE EQUIVALENT FUEL ECONOMY DETERMINATION FOR ALTERNATE AUTOMOTIVE FUELS

Craig A. Harvey Aug. 1981 41 p refs
(PB82-120072; EPA/AA/CTAB/PA/81-16) Avail: NTIS HC A03/MF A01 CSCL 21D

Some basis for a decision on the most appropriate methodology for calculating the gasoline equivalent fuel economy of a vehicle that uses fuel other than gasoline is provided. Once this methodology is determined, it will provide vehicle manufacturers with a way to gauge the effects of alternative marketing options on their average fuel economy. GRA

N82-18413# Ohio Dept. of Natural Resources, Columbus. Water Planning Unit.

SOUTH POINT GASOHOL PROJECT: A WATER ASSESSMENT STUDY

Carrie J. Groves, David Denig-Chakroff, and Arthur F. Woldorf May 1981 50 p refs
(Contract WR20424491)
(PB82-111485) Avail: NTIS HC A03/MF A01 CSCL 21D

Section 13 of the Federal Non-nuclear Energy Research and Development Act of 1974 provides for water assessment reports to be prepared by the Water Resources Council on commercial applications of energy technologies which may have a significant impact on water resources. A summary of the principal findings of the study are reported; (1) a description of the project, (2) water supply availability (3) an analysis of surface-water and groundwater resources with special attention given to potential water quantity/quality impacts of the project and (4) environmental and socio-economic effects of potential water resources impacts. GRA

N82-18414# West Virginia Univ., Morgantown.

AN ECONOMIC ANALYSIS OF COAL SUPPLY IN THE OHIO RIVER BASIN ENERGY STUDY REGION

Walter P. Page Oct. 1981 83 p refs
(Grant EPA-R-805585)
(PB82-113341; EPA-600/7-81-162) Avail: NTIS HC A05/MF A01 CSCL 21D

Using the energy and fuel demand model developed for the Ohio River Basin Energy Study (ORBES) region (all of Kentucky, most of West Virginia, substantial portions of Illinois, Indiana and Ohio and southwestern Pennsylvania), coal production levels were projected. A separate research effort allocated the tonnage to producing districts by mine and coal type. The coal supply work focused on identifying the coal supply districts that have historically served the ORBES region and estimating the resource depletion costs associated with expanded levels of coal production between 1974 and 2000. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-18415 Georgia Inst. of Tech., Atlanta.

FINITE-ELEMENT FORMULATION FOR THE ANALYSIS OF INTERFACES, NONLINEAR AND LARGE DISPLACEMENT PROBLEMS IN GEOTECHNICAL ENGINEERING Ph.D. Thesis

Adolfo E. Zeevaert 1980 285 p
Avail: Univ. Microfilms Order No. 8124300

A mathematical formulation to model the behavior under load of a reinforced soil system, where a fabric is placed over a soft soil and covered with stone for use as a temporary haul road is discussed. This approach is used to improve the behavior of temporary roadways, particularly where very soft soils are encountered. The stress distribution and the load-deformation characteristics of the soil-fabric system for varying geometries and material properties are defined. Included in the mathematical formulation are such features as: nonlinear behavior of the soil and fabric materials, friction parameters of the interface, tension characteristics of the fabric materials, large displacements in finite deformation, 'no tension' conditions of the cohesionless materials, and yielding of plastic materials. The mathematical model is a more complete approximation of the actual fabric-soil system than is presently available. Dissert. Abstr.

N82-18416# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario). Div. of Building Research.

MANUAL ON PHYSICO-CHEMICAL STRENGTHENING OF FREEZING AND THAWING SOILS

1981 99 p Transl. into ENGLISH of "Rukovodstvo po Tekhnol. Fiz.-Khim. Ukrepleniya Promerzayushchikh i Ottaivayushchikh Gruntov" N.M. Gersevanov Sci. Res. Inst. (USSR), Moscow, 1977 p 1-68
(NRC/CNR-TT-1978; ISSN-0077-5506) Avail: NTIS HC A05/MF A01

The planning and execution of work on preconstruction improvement of the construction characteristics of perennially and seasonally frozen soils which are to be used as bases for buildings and structures are presented. Instructions for carrying out foundation excavations, for preventing frost heaving of soils and heaving of foundations under winter freezing conditions are included. Thawing of seasonally and perennially frozen soils with the aid of electric power and chemical agents when the temperature is both above and below zero, and also compaction and heave stabilization of such soils are discussed. S.L.

N82-18417# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Applied Research Branch.

FOUNDATIONS OF STRUCTURES IN POLAR WATERS

Edwin J. Chamberlain Oct. 1981 18 p refs Sponsored in part by Geological Survey
(AD-A108344; CRREL-SP-81-25) Avail: NTIS HC A02/MF A01 CSCL 13/13

Artificial islands and gravity- and pile-founded towers used for the exploration and production of petroleum resources in the Alaskan Beaufort Sea will be affected by conditions not found in more temperate waters. The force of sea ice, the thawing of subsea permafrost, and seasonal freezing and thawing all may cause failure of the foundations of these structures. To ensure the stability of foundations and fill structures, special precautions must be taken in selecting sites and evaluating the engineering properties of sea bed and fill materials. Author (GRA)

N82-18418# Aeronautical Research Labs., Melbourne (Australia).

PERFORMANCE ANALYSIS OF VAPOUR CYCLE COOLING SYSTEMS

Brian Rebbechi, John L. Fowler, Neil J. Repacholi, and Gordon L. Collins Mar. 1981 50 p refs
(AD-A108254; ARL/MECH/ENG/NOTE-386) Avail: NTIS HC A03/MF A01 CSCL 13/1

The performance of several different configurations of vapor cycle cooling systems, using automotive-type components, has been experimentally determined. Performance of the individual components has also been analysed and presented in a form appropriate for assessing the suitability of their application to other system types. Author (GRA)

N82-18419# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsberetch.

ELECTROFORMING OF SPACE AND AIRCRAFT STRUCTURES

R. Suchentrunk 1981 9 p refs
(MBB-BB-491-0) Avail: NTIS HC A02/MF A01

Application of electroforming, a production technique for complicated structures, to aircraft and spacecraft structures and components is addressed. The process of electrodeposition is described and the advantages of the electroformed structures are highlighted. Materials suitable for the mandrels and for electrodeposition are discussed emphasizing preferred properties. J.M.S.

N82-18420# Centre Technique des Industries Mecaniques, St. Etienne (France).

EXPLORATORY STUDY ON MANUAL DRILLING [ETUDE EXPLORATOIRE DU PERCAGE MANUEL]

J. P. Faurie May 1981 12 p In FRENCH
(CETIM-1-6E-0-60) Avail: NTIS HC A02/MF A01

Using a common, handheld electric drill, the suitability of this tool to drilling 2, 4, 6, 8, 10, and 13mm dia holes in 20mm thick sheet steel was determined. Given an operator whose pushing ability is limited (approximately 30 daN), whether or not the torque and speed of the drill are well adapted to the job was studied. Although the results are inconclusive (wide

dispersion in measurements), a norm for job suitability is foreseen for portable drills. Author (ESA)

N82-18421# Centre Technique des Industries Mecaniques, St. Etienne (France).

EXPLORATORY STUDY ON A UNIVERSAL WORKSHOP Final Report [ETUDE EXPLORATOIRE ATELIERS FLEXIBLES]

M. Jubin Jul. 1981 112 p refs In FRENCH
(CETIM-1-4N-12-9) Avail: NTIS HC A06/MF A01

The flexibility of the industrial workshop in performing a variety of fabrication jobs is considered. The relatively large amount of production time which is lost due to too much (production line) or too little (single jobber) machine specificity is cited. A best possible compromise between productivity and job flexibility is sought. An automated universal workshop is proposed. The individual fabrication units are described, taking machine tool manufacture as an example. The control system and materials handling system are depicted. Generalization to most mechanical construction tasks is regarded as feasible. Author (ESA)

N82-18422# Battelle Pacific Northwest Labs., Richland, Wash.

PHYSICAL AND CHEMICAL CHARACTERISTICS OF SYNTHETIC ASPHALT PRODUCED FROM LIQUEFACTION OF SEWAGE SLUDGE Final Report, Sep. 1979 - Apr. 1981

J. M. Donovan, T. R. Batter, R. K. Miller, and R. P. Lottman (Idaho Univ., Moscow) Oct. 1981 67 p refs
(Grant EPA-R-806790)
(PB82-119082; EPA-600/2-81-242) Avail: NTIS HC A04/MF A01 CSCL 13B

Direct thermochemical liquefaction of primary undigested municipal sewage sludge was carried out to produce a low molecular weight steam volatile oil, a high molecular weight synthetic asphalt, and a residual char cake. The latter product is capable of supplying the thermal energy requirements of the conversion process. The steam volatile oil has immediate value as a synthetic fuel oil. The synthetic asphalt may prove to be a useful cement for paving or for fuel or coking stock. The thermochemical liquefaction process should be capable of operating technically and in an environmentally acceptable manner in conjunction with many existing waste water treatment facilities. The overall feasibility of the process depends on the value of the oil and synthetic asphalt products as petroleum replacements, and on the costs associated with disposal of sludge. GRA

N82-18423# Cambridge Univ. (England). Dept. of Engineering.

COLLAPSE LIMIT STATES OF REINFORCED EARTH RETAINING WALLS

M. D. Bolton and P. L. R. Pang (Allott and Lomax) 1981 67 p refs
(PB82-113515; CUED/D-SOILS/TR-102-1981;
ISSN-0309-7439) Avail: NTIS HC A04/MF A01 CSCL 08M

The use of systems of earth reinforcement or anchorage is gaining in popularity. It therefore becomes important to assess whether the methods of design which were adopted for such constructions represent valid predictions of realistic limit states. Confidence can only be gained with regard to the effectiveness of limit state criteria if a wide variety of representative limit states were observed. Over 80 centrifugal model tests of simple reinforced earth retaining walls were carried out, with the main purpose of clarifying the nature of appropriate collapse criteria. Collapses due to an insufficiency of friction were shown to be repeatable and therefore subject to fairly simple limit state calculations. GRA

N82-18424# Cambridge Univ. (England). Dept. of Engineering.

PMATRX: AN ALGORITHM FOR TRANSFORMING N-DIMENSIONAL DATA INTO PLOTTED CURVES

C. M. Szalwinski 1981 34 p Sponsored in part by the Transport and Road Research Lab. and the Ford of Britain Trust
(PB82-114463; CUED/D-SOILS/TR-110-1981;
ISSN-0309-7439) Avail: NTIS HC A03/MF A01 CSCL 08M

An algorithm - PMATRX - for the plotting of different aspects of a soils stress-strain history is presented. Several histories can be described on the same reference frame. Each frame relates 2 variables of an n-variable history. The complete plot consists of a matrix of such frames. An example of PMATRX's use on the Cambridge University IBM/370 is provided. Programmer's documentation is included as an Appendix. The algorithm can serve either-along or as a post-processor to data-generation programs. GRA

N82-18425# Electricity Council Research Centre, Capenhurst (England).

THE CAPENHURST WESTAIR HIGH TEMPERATURE HEAT PUMP DRYER

J. L. Driscoll, M. P. Bertinat, F. G. Drakesmith, J. T. Griffith, D. L. Hodgett, F. W. Sharman, R. Stirling, I. Strutt, B. J. Taylor, and R. H. Johnson Jun. 1981 27 p
(PB82-116690; ECRC/R-1440) Avail: NTIS HC A03/MF A01 CSCL 13A

The Capenhurst Westair High Temperature Heat Pump Dryer is an efficient electrical system for batch convection drying of solids such as timber. The use of a heat pump enables heat from the water evaporated to be recovered and re-used in the dryer. Energy requirements can be reduced by up to two thirds with significant savings in running costs. Capenhurst has progressed heat pump drying technology so that products can now be dried at temperatures up to 80 C. A 9 kilowatt packaged heat pump unit utilizing this technology was produced through a program of joint research and development with Westair Dynamics Ltd. The Capenhurst Westair Dryer, its development and the benefits of using the system for drying timber and other products, is described. GRA

N82-18426# Intermountain Forest and Range Experiment Station, Ogden, Utah.

PATTERN: A SYSTEM FOR LAND MANAGEMENT PLANNING

Richard J. Barney and Toni Rudolph Aug. 1981 13 p refs
(PB82-101452; FSRN-INT-318) Avail: NTIS HC A02/MF A01 CSCL 13B

The planning assistance through technical evaluation of relevance numbers system is described. It is a procedure for identifying and ranking key factors in land management decisions. The technique is applied to a hypothetical example. GRA

N82-18427# Notre Dame Univ., Ind.

CANDE-1980: BOX CULVERTS AND SOIL MODELS Final Report, Nov. 1978 - Oct. 1980

M. G. Katona, P. D. Vittes, Ch. H. Lee, and H. T. Ho May 1981 218 p refs
(Contract DOT-FH-11-9408)
(PB82-102393; FHWA/RD-80/172) Avail: NTIS HC A10/MF A01 CSCL 13B

The CANDE computer program, introduced in 1976 for the structural design and analysis of buried culverts, is extended and enhanced in this work effort to include options for automated finite element analysis of precast, reinforced concrete box culverts, and new nonlinear soil models. User input instructions for the new options, now operative in the CANDE-1980 program, are provided in the appendix of this report along with example input/output data. GRA

N82-18428# Bureau of Mines, Tuscaloosa, Ala.

CERAMIC ROADWAY AGGREGATES WITH IMPROVED POLISH AND WEAR RESISTANCE Final Report, Mar. 1977 - Dec. 1980

Arthur V. Petty, Jr. Aug. 1981 107 p refs
(PB82-103987; FHWA/RD-81/136) Avail: NTIS HC A06/MF A01 CSCL 13C

Synthetic ceramic aggregates having high wear- and polish-resistance were developed. Three hundred aggregate compositions, incorporating a variety of low-cost 'waste' materials were evaluated. Aggregates were produced using conventional ceramic processing techniques and fired at temperatures ranging from 900-1,500 C. British Wheel and L. A. Abrasion tests were used for initial screening of the aggregates. These data, raw material costs, availability, and energy requirements, were used to select nine compositions for circular track tests. Economic evaluations showed that present production costs, based on a 1,000 ton-per-day operation ranged from $10 to $120 per ton

of material produced. Guyana bauxite was used as a standard. GRA

N82-18429# Stanford Univ., Calif. Earthquake Engineering Center.

PROBABILISTIC AND HAZARD ANALYSIS FOR PORE PRESSURE INCREASE IN SOILS DUE TO SEISMIC LOADING

G. W. Clough and Jean-Lou Chameau May 1981 246 p refs Sponsored in part by Geological Survey

(Grants NSF PFR-80-07083; NSF ENV-77-17834)

(PB82-122417; NSF/CEE-81038) Avail: NTIS HC A11/MF A01 CSCL 08M

The likelihood of pore pressure build-up during an earthquake is evaluated. Methods for pore pressure development and liquefaction are reviewed and the behavior of cohesionless soils in cyclic loading are investigated. A probabilistic pore pressure model using laboratory data; the probabilistic development of pore pressure using an effective stress model; and a probabilistic pore pressure analysis and seismic hazard evaluation are described. GRA

N82-18430# Stanford Univ., Calif. Earthquake Engineering Center.

THEORY AND APPLICATION OF EXPERIMENTAL MODEL ANALYSIS IN EARTHQUAKE ENGINEERING

Helmut Krawinkler and Piotr D. Moncarz Jun. 1981 4 p refs (Grants NSF ENV-77-1444; NSF ENV-75-20036)

(PB82-122409; NSF/CEE-81037) Avail: NTIS HC A02/MF A01 CSCL 13M

The feasibility and limitations of small-scale model studies in earthquake engineering and practice are summarized. Emphasis is placed on dynamic modeling theory; a study of the mechanical properties of model materials; the development of model construction techniques; and an evaluation of the accuracy of prototype response prediction through model case studies on components and simple structures. Materials for modeling of steel and reinforced concrete structures are examined with regard to cyclic load effects. Systematic material testing procedures were developed. Problems encountered in the construction of models are identified. Research demonstrates that model analysis can be used in to obtain quantitative information on the seismic behavior of complex structures. GRA

N82-18431# Council for Scientific and Industrial Research, Pretoria (South Africa).

THE 2ND SEMINAR ON EFFICIENT METAL FORMING AND MACHINING

1980 252 p refs Proceedings of Conf. held at Pretoria, 18 Nov. 1980

(PB82-109745; CSIR-S-234; ISBN-0-7988-2015-2) Avail: NTIS HC A12/MF A01 CSCL 13H

Metalspinning, shear and flow forming are discussed. Optimized machining is surveyed. Automatic tool wear compensation is addressed. Ceramic coatings for wear resistance are covered. Creep grinding using diamond wheel is presented. Economics of numerical control machining are reported. Amber Boron Nitride and its industrial application is discussed. Wear resistant coatings on hard metal are described. The explosive hardening of metals is examined. The selection of machining parameters using Amborite on hard ferrous material is discussed. Drawing and wall ironing of metal cans is investigated. Economical cutting with the CO2 gas laser is presented. Developments in the deep drawing of a cylindrical cup are considered. Training black machinist is reviewed. The role of investment casting in modern engineering practices is covered. Cold forming of internal threads is included. High speed steel cutting tools are described. Hot forging is summarized. N.W.

N82-18432# Transport and Road Research Lab., Crowthorne (England). Materials Div.

HOT ROLLED ASPHALT: EFFECT OF BINDER PROPERTIES ON RESISTANCE TO DEFORMATION

F. A. Jacobs 1981 22 p refs

(PB82-122664; TRRL-LR-1003; ISSN-0305-1293) Copyright. Avail: Issuing Activity CSCL 13C

Those properties of binders that most affect the resistance to deformation of rolled asphalt are discussed. Thirteen binders were studied and mixtures containing them were subjected to design tests and the wheel tracking test. These laboratory mechanical tests show that, within the range of binders tested, significant improvements in resistance to deformation can be achieved over a range of high road temperatures by increasing the softening point of the binder, irrespective of its penetration at 25 C. Author (GRA)

N82-18433# Connecticut Dept. of Transportation, Wethersfield. Bureau of Highways.

ENERGY EQUIVALENTS FOR SELECTED PAVEMENT MATERIALS: THEIR PRODUCTION AND PLACEMENT Final Report, Dec. 1978 - Mar 1981

Keith R. Lane Mar. 1981 105 p refs Prepared in cooperation with FHWA, Washington, D.C.

(Proj. HPR-569)

(PB82-121187; FHWA-CT-81-4; Rept-569-F-81-4) Avail: NTIS HC A06/MF A01 CSCL 13C

Energy requirements for selected pavement surfaces are discussed. Energy requirements for hot-mixed bituminous recycling and portland cement concrete recycling projects are presented along with conventional pavement methods. Energy requirements for conventional thin surface treatments are also discussed. Environmental analyses involving both air and noise quality measurement are included for various recycling and conventional paving options. GRA

N82-18434# Federal Highway Administration, Washington, D.C. Materials Div.

PROPERTIES OF PORTLAND CEMENT CONCRETES CONTAINING POZZOLANIC ADMIXTURES

D. D. Simmons, T. J. Pasko, Jr., and W. R. Jones Apr. 1981 52 p refs

(PB82-120965; FHWA/RD-81/184) Avail: NTIS HC A04/MF A01 CSCL 13C

A laboratory comparison was made of the properties of a concrete containing no pozzolan with several mixtures containing pozzolans. Used were a natural pozzolan (Lassenite), two fly ashes of different fineness and low carbon and an amorphous silica fume dust from a metal-producing plant. One cement, one coarse crushed limestone aggregate, and one fine river aggregate were used. Replacing a faster reacting binder with a slower one, produced lower early strengths and adversely affected the properties which are highly dependent on strength. The measures of durability were greatly affected by the air contents and aging or treatment prior to exposure. The amorphous silica fume dust increased the early strengths of a fly ash mixture. GRA

N82-18435# National Bureau of Standards, Washington, D.C. National Engineering Lab.

ANALYSIS OF THERMAL STRESSES IN INTERNALLY SEALED CONCRETE BRIDGE DECKS Final Report, Jul. 1977 - Dec. 1979

S. George Fattal, Timothy A. Reinhold, and Bruce Ellingwood Apr. 1981 119 p refs Sponsored by the Federal Highway Administration

(PB82-122888; FHWA/RD-80/085) Avail: NTIS HC A06/MF A01 CSCL 13B

A structural model was developed for use with a finite element program to predict thermal stresses which result from the application of heat to the concrete decks of highway bridges. The decks are heated to obtain an internally sealed concrete so as to better protect the reinforcement from deicer induced corrosion. Simple decks were first studied to determine the sensitivity of the solutions to various modeling assumptions. Two full scale bridge decks were also analyzed for which the temperature distributions are predefined on the basis of field data. The model will provide a helpful tool which will enable future field measurements to be planned more selectively. It will also provide insight on means for improving the heat treatment process so as to minimize cracking damage. GRA

N82-18436# Texas Univ. at Arlington. Center for Transportation Research.

ANALYSIS OF POST-TENSIONED GIRDER ANCHORAGE ZONES

W. C. Stone and J. E. Breen Jun. 1981 174 p refs Prepared in cooperation with the Federal Highway Administration, Austin, Tex.

(PB82-122268; CTR-3-5-77-208-1; FHWA/TX-81/13-208-1; RR-208-1) Avail: NTIS HC A08/MF A01 CSCL 13B

Several large thin-webbed box girders, with post-tensioned anchorage zones experienced large cracks along the tendon path in the anchorage zones at the design stressing load. Cracking provides a path for penetration of moisture and salts and thus presents a potential corrosion and frost damage threat. Such cracking negates the use of prestressed concretes. An extensive literature review which documents the state of the art in anchorage zone analysis behavior, and design recommendations is summarized. The general utilization of a three dimensional finite element program, PUZGAP3D, for analysis of the complex anchorage zone region is outlined. The program was used to study straight and curved tendon paths. GRA

N82-18437# National Bureau of Standards, Boulder, Colo. National Engineering Lab.

PRELIMINARY GUIDELINES FOR CONDITION ASSESSMENT OF BUILDINGS BEING CONSIDERED FOR SOLAR RETROFIT

Frank H. Lerchen, James H. Pielert, and Phillip T. Chen Jul. 1981 142 p refs Sponsored by DOE

(PB82-113259; NBSIR-81-2289) Avail: NTIS HC A07/MF A01 CSCL 13A

A general description of methods currently available for condition assessment of the structural heating, ventilating, and air conditioning (HVAC); electrical and plumbing systems of an existing building are reported. The feasibility of rehabilitation for solar retrofit is determined. GRA

N82-18438# West Virginia Univ., Morgantown.

ECONOMIC LOSSES IN THE COLUMBUS SMSA DUE TO LONG-RANGE TRANSPORT OF AIRBORNE RESIDUALS IN THE OHIO RIVER BASIN ENERGY STUDY REGION

Walter P. Page and John M. Gowdy Oct. 1981 129 p refs (Grant EPA-R-805585)

(PB82-110735; EPA-600/7-81-161) Avail: NTIS HC A07/MF A01 CSCL 13B

Central Ohio is an area where the long range transport of air pollutants is a problem, and a relatively small increase in pollution emitted from sources within the standard metropolitan statistical area (SMSA) could cause the area to violate federal primary standards for sulfur doxide and particulates. The potential loss in economic product to the Columbus SMSA is estimated by calculating the difference in economic output between the projected increase in potential output possible under existing air quality regulations without additional background pollution from new out of area fossil fuel power plants, and the projected increased in output possible when this additional source of pollution is taken into account. Estimated losses are provided for seven different ORBES scenarios. GRA

N82-18439# West Virginia Univ., Morgantown.

ESTIMATING REGIONAL LOSSES TO AGRICULTURAL PRODUCERS FROM AIRBORNE RESIDUALS IN THE OHIO RIVER BASIN ENERGY STUDY REGION, 1976-2000 Final Report

Walter P. Page, James Ciecka (DePaul Univ., Chicago, Ill.), and Gary Arbogast Oct. 1981 157 p refs

(Grants EPA-R-805585; EPA-R-805588)

(PB82-113879; EPA-600/7-81-164) Avail: NTIS HC A08/MF A01 CSCL 13B

Monetary losses to agricultural producers from airborne residuals in the ORBES region (all of Kentucky, most of West Virginia, southwestern Pennsylvania, and substantial portions of Illinois, Indiana and Ohio) are considered. Results are reported for three energy development scenarios--a base case; a case assuming non-compliance with state implementation plans (SIPs); and a high electrical energy growth case. Two different analyses are provided, one based on nominal load emissions from ORBES-region utilities and the other based on peak load emissions. GRA

N82-18440# Indiana Univ. at Bloomington.

OHIO RIVER BASIN ENERGY STUDY: LAND USE AND TERRESTRIAL ECOLOGY Final Report

J. C. Randolph and William W. Jones Sep. 1981 177 p refs (Grant EPA-R-805609)

(PB82-110347; EPA-600/7-81-062) Avail: NTIS HC A09/MF A01 CSCL 13B

Land use and terrestrial ecology data and analyses for the Ohio River Basin Energy Study (ORBES) region consisting of all of Kentucky, most of West Virginia, and substantial portions of Illinois, Indiana, Ohio, and Pennsylvania is presented. This 122 million acre region has a variety of land uses, which are summarized. Also discussed is the terrestrial ecology of the region (climate, physiography, soils, flora, fauna, and ecosystem dynamics). For the various ORBES energy development scenarios, land use conversion due to energy-related use was calculated, and impacts on terrestrial ecology were determined by application of the terrestrial ecosystem assessment methodology developed for ORBES. GRA

N82-18441# Illinois Univ. at Chicago Circle, Chicago.

ELECTRICAL GENERATING UNIT INVENTORY 1976-1986: ILLINOIS, INDIANA, KENTUCKY, OHIO, PENNSYLVANIA AND WEST VIRGINIA

Steven D. Jansen Sep. 1981 94 p (Grant EPA-R-805588)

(PB82-112194; EPA-600/7-81-057) Avail: NTIS HC A05/MF A01 CSCL 13B

The ORBES region consists of all of Kentucky, most of West Virginia, substantial parts of Illinois, Indiana, and Ohio, and southwestern Pennsylvania. The inventory lists installed electrical generating capacity in commercial service as of December 1, 1976, and scheduled capacity additions and removals between 1977 and 1986 in the six ORBES states (Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia). The following information is included for each electrical generating unit: unit ID code, company index, whether point or industrial ownership, plant name, whether inside or outside the ORBES region, FIPS county code, type of unit, size in megawatts, type of megawatt rating, status of unit, data of commercial operation, scheduled retirement date, primary fuel, alternate fuel, type of cooling, source of cooling water, and source of information. GRA

N82-18442# Illinois Univ. at Chicago Circle, Chicago.

THE OHIO RIVER BASIN ENERGY FACILITY SITING MODEL. VOLUME 2: SITES AND ON-LINE DATES

Gary L. Fowler, Robert E. Bailey, Steven D. Jansen, J. C. Randolph, W. W. Jones, and Steven I. Gordon Sep. 1981 145 p Prepared in cooperation with Indiana Univ., Bloomington

(Grants EPA-R-805589; EPA-R-805609; EPA-R-805588)

(PB82-112111; EPA-600/7-81-043-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 13B

The siting model developed for the Ohio River Basin Energy Study, and specifically designed for regional policy analysis is included. The region includes 423 counties in an area that consists of all of Kentucky and substantial portions of Illinois, Indiana, Ohio, Pennsylvania, and West Virginia. Detailed schedules of county-level sites and on-line dates for coal-fired and nuclear-fueled generating unit additions for each ORBES scenario are included. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-18443* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD FOR SHAPING AND AIMING NARROW BEAMS Patent

Richard C. Heyser, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 1 Sep. 1981 9 p Filed 7 Nov. 1979 Supersedes N80-12256 (18 - 03, p 0313)

(NASA-Case-NPO-14632-1; US-Patent-4,287,578; US-Patent-Appl-SN-092143; US-Patent-Class-367-88; US-Patent-Class-367-102; US-Patent-Class-367-100) Avail: US Patent and Trademark Office CSCL 17B

A sonar method and apparatus is discribed which utilizes a linear frequency chirp in a transmitter/receiver having a correlator to synthesize a narrow beamwidth pattern from otherwise broadbeam transducers when there is relative velocity between the transmitter/receiver and the target. The chirp is so produced in a generator in bandwidth, B, and time, T, as to produce a time bandwidth product, TB, that is increased for a narrower angle. A replica of the chirp produced in a generator is time delayed and Doppler shifted for use as a reference in the receiver for correlation of received chirps from targets. This reference is Doppler shifted to select targets preferentially, thereby to not only synthesize a narrow beam but also aim the beam in azimuth and elevation.

Official Gazette of the U.S. Patent and Trademark Office

N82-18444* McDonnell-Douglas Astronautics Co., St. Louis, Mo.

ULTRAMICROWAVE COMMUNICATIONS SYSTEM, PHASE 3 Final Report

23 Oct. 1981 132 p refs

(Contract NAS9-15617)

(NASA-CR-167519; MDC-E2461) Avail: NTIS HC A07 CSCL 17B

The ultramicrowave communications system program investigated the feasibility of a solid state system that meets the projected space to space requirements, while using the advantages of the 100 to 200 GHz band. The program successfully demonstrated a laboratory model of a high frequency communications system operating between 100 to 200 GHz. In the process, vendor claims for performance specifications of discrete components were evaluated, and a window was provided into system design and integration problems. S.L.

N82-18445 Ohio State Univ., Columbus.

EFFECTS OF ATMOSPHERIC TURBULENCE ON MICROWAVE AND MILLIMETER WAVE SATELLITE COMMUNICATIONS SYSTEMS Ph.D. Thesis

Daniel Manoharan Jothiraj Devasirvatham 1981 230 p

Avail: Univ. Microfilms Order No. 8128988

A model of the microwave and millimeter wave link in the presence of atmospheric turbulence, with emphasis on satellite communications systems is described. The analysis is based on standard methods of statistical theory. Effects of turbulence on the received wave are studied using the Kolmogorov, Von Karman, and Gaussian models, and compared. An equivalent structure constant is also defined for the latter. A generalized theory of the aperture antenna in turbulence is formulated. The uniform and tapered circular aperture antennas are specifically evaluated for any arbitrary angle of arrival of the wave in the main beam, and related to each other. Receivers are classed as synchronous and asynchronous. The signal measured by each class is described. Using experimental results, an equivalent atmosphere, homogeneously turbulent over the propagation path, with appropriate parameters, is shown to be suitable for prediction of long term average behavior. Dissert. Abstr.

N82-18446 Ohio State Univ., Columbus.

A FOUR-PHASE MODULATION SYSTEM FOR USE WITH AND ADAPTIVE ARRAY Ph.D. Thesis

Jack H. Winters 1981 248 p

Avail: Univ. Microfilms Order No. 8129119

The use of four-phase modulation in a communication system with an adaptive array is discussed. A system is described that provides protection against both conventional (i.e., noise and CW) and smart (in particular, repeat) jamming with rapid acquisition of the signal at the receiver. Four-phase modulation techniques and how they can be used with an adaptive array are discussed. Reference signal generation for the LMS adaptive array is discussed for these modulation techniques. A communication system is then described that uses one of these modulation techniques. The four-phase signal consists of two orthogonal biphase signals. One signal contains a short code for rapid acquisition. The other contains a long code for protection against smart jammers. A several step signal acquisition technique is also described for the system. The short code timing is first acquired by sliding correlation method. The system is then analyzed theoretically. Dissert. Abstr.

N82-18447 Royal Signals and Radar Establishment, Malvern (England).

IMPEDANCE OF MONOPOLE ANTENNAS ON VEHICLES BY MOMENT METHODS

D. J. Brammer 23 Sep. 1981 12 p refs

(RSRE-MEMO-3414; BR81100) Copyright. Avail: Issuing Activity

The accuracy with which impedance is calculated was investigated by checking NEC 1 predictions against theoretical and experimental literature data for an idealized shape. A copper model was measured using a network analyzer. Good results are obtained if: large changes are avoided in dimension between element length in the monopole and element length or patch size in modeled surface; and capacitance values needed to adjust impedances to their idealized values are found.

Author (ESA)

N82-18448# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DETERMINATION OF THE FIELD SCATTERED BY AN AXIALLY INCIDENT PLANE WAVE [DETERMINACAO DO CAMPO ESPALHADO POR UM PARABOLOIDE, DEVIDO A UMA ONDA PLANA AXIALMENTE INCIDENTE]

L. B. T. Cividanes and C. E. Santana Jul. 1981 39 p refs In PORTUGUESE; ENGLISH summary

(INPE-2179-NTE/175) Avail: NTIS HC A03/MF A01

The application of the geometrical theory of diffraction (GTD) to the determination of the electromagnetic field scattered by a paraboloidal reflector under axial plane wave illumination is described. The method of calculation is illustrated through applications to a small antenna (D = 50 lambda) and to a large one (D = 400 lambda). It is shown that the GTD is very accurate and fast in calculating the scattering by a paraboloidal reflector in its focal region. As compared to the more traditional methods of calculation, namely the geometrical and physical optics, the GTD offers marked improvement and advantage. T.M.

N82-18449*# North Carolina State Univ., Raleigh. Dept. of Electrical Engineering.

COMPUTER PREDICTION OF DUAL REFLECTOR ANTENNA RADIATION PROPERTIES

Christos Christodoulou Nov. 1981 138 p refs

(Grant NsG-1588)

(NASA-CR-165114) Avail: NTIS HC A07/MF A01 CSCL 20N

A program for calculating radiation patterns for reflector antennas with either smooth analytic surfaces or with surfaces composed of a number of panels. Techniques based on the geometrical optics (GO) approach were used in tracing rays over the following regions: from a feed antenna to the first reflector surface (subreflector); from this reflector to a larger reflector surface (main reflector); and from the main reflector to a mathematical plane (aperture plane) in front of the main reflector. The equations of GO were also used to calculate the reflected field components for each ray making use of the feed radiation pattern and the parameters defining the surfaces of the two reflectors. These resulting fields form an aperture distribution which is integrated numerically to compute the radiation pattern for a specified set of angles. T.M.

N82-18450# Committee on Science and Technology (U. S. House).

NASA SPACE COMMUNICATIONS PROGRAM

Washington GPO 1982 25 p Presented by the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2nd Sess., Feb. 1982

(GPO-85-553) Avail: Subcommittee on Space Science and Applications

A summary of NASA's space communications research and development program is provided. NASA's role in space communications, particularly in the 30/20 Gigahertz research and development program is discussed. How NASA should plan for space communications beyond 1990, and how NASA can best distribute public information concerning space communications is also discussed. R.J.F.

N82-18451# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LINK AVAILABILITY IN SATELLITE TELECOMMUNICATION SUBJECT TO CORRELATED RAIN ATTENUATION AT THE GROUND TERRAIN

Aydano B. Carleial and Janio Kono Nov. 1981 22 p refs Presented at IEEE Intern. Conf. on Commun.

(INPE-2280-PRE/058) Avail: NTIS HC A02/MF A01

A link model for satellite telecommunication is presented, and the problem of link outage due to signal strength attenuation caused by rain in the two propagation paths (Earth-to-space and space-to-Earth) is considered. A joint probability density for up-path and down-path losses is used for computation of link availability by numerical integration of the density over the region of the plane that corresponds to satisfactory telecommunication. It is shown that correlation between the marginal probability densities for the two path losses can have a significant effect on link availability for SCPC networks. The importance of this result lies in the fact that, in satellite networks with a large number of thin-route users, ground terminals are sometimes so close to each other that rain events and rates of rainfall at their sites cannot be assumed independent. Author

N82-18452# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPUTER IMPLEMENTATION OF A PROGRAM FOR THE ANALYSIS OF CIRCULAR REFLECTORS USING THE GEOMETRIC THEORY OF DIFFRACTION [IMPLEMENTACAO EM COMPUTADOR DE UM PROGRAMA PARA ANALISE DE REFLETORES CIRCULARES USAN DO TEORIA GEOMETRICA DE DDIFRACAO]

Benjamim daSilva Medeiros Galvao and Carlos Alberto Iennaco Miranda Jun. 1981 71 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981

(INPE-2132-RPE/356) Avail: NTIS HC A04/MF A01

The total field radiated by a circularly symmetric parabolic reflector, including effects of scattering of cylindrical struts and blockage by the feed horn is calculated. A combination of aperture integration method and geometrical theory of diffraction is used for the calculation of the total field. An analysis of the off principal plane patterns is carried out, in order to study the scattering effects of the struts in the sidelobes. This program has the capability to plot each field component of the total field. S.L.

N82-18453# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A DOUBLE-BALANCED MIXER FOR 2 GHz [MISTURADOR DUPLAMENTE BALANCEADO PARA 2 GHZ]

Eduardo Antonio Parada Tude and Lucio Baptista Trannin Cividanes Jul. 1981 11 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981 Original contains color illustrations

(INPE-2150-RPE/371) Avail: NTIS HC A02/MF A01

The design and construction of the mixer and of a microstrip-line filter are described. The mixer and filter are intended to upconvert a signal of 75 MHz, +10 dBm to an IF, signal at 1995 MHz. The mixer output signal will feed an earth station transmitter. In order to function with this high input level, the mixer was built with four pairs of Schottky diodes, each pair connected, in series to a star configuration. The coupling of the signals to the diodes is accomplished through a strip-line balanced line hybrid coupler. Strip-line baluns are used to connect the balanced line hybrid to the unbalanced 50 ohms ports. Using conventional glass-encapsulated diodes, the mixer exhibited a dB conversion loss, and the measured 1 dB compression point was +10 dBm. T.M.

N82-18454# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

RADIOMETRIC STUDIES OF THE HEAT ISLAND [ESTUDOS RADIOMETRICOS DA ILHA DE CALOR]

Magda Adelaide Lombardo, Antonio Eduardo Costa Pereira, Gilberto Camera Neto, and Luiz Alberto Vieira Dias Jul. 1981 9 p refs IN PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador-Bahia, Brazil, 8-15 Jul. 1981

(INPE-2156-RPE/375) Avail: NTIS HC A02/MF A01

The influence of the 'heat island' in the atmospheric transmittance and in the contrast of thermal images was studied. The transmittance and contrast were calculated for a real atmospheric and for an atmosphere with a simulated heat island. As a result of these calculation, it was possible to verify that the influence of the heat island in the transmittance and in the contrast were analogous. N.W.

N82-18455# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A NEW EXTERNAL LIMIT TO THE CAPACITY OF INTERFERENCE CHANNELS [UM NOVO LIMITANTE EXTERNO A CAPACIDADE DO CANAL COM INTERFERENCIA]

Aydano Barreto Carleial Jul. 1981 20 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981

(INPE-2162-RPE/380) Avail: NTIS HC A02/MF A01

An interference channel is a communication network where two senders communicate with two receivers through a shared medium, in such a way that the flow of information over the first link (from the first sender to the first receiver) can impair the flow over the second link, and vice versa. If R1 and R2 are the rates of information transmission over the first and second link, respectively, the channel's capacity region is the set of pairs (R1,R2) which are jointly achievable in reliable communications. The problem of determining the capacity region has been solved only in some special cases, in particular in strong interference cases. A new outer bound on the capacity region of the Gaussian interference channel is demonstrated by means of the technique involving degradation of a modified channel by added noise. In those cases where the interference is of medium intensity, which in practice, are more common than strong interference cases, the new bound is significantly, tighter than previously known outer bounds. J.M.S.

N82-18456# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

RELATIONAL DATA BANK FOR BURROUGHS COMPUTERS [BANCO DE DADOS RELACIONAL PARA COMPUTADORES BURROUGHS]

Paulo Cesar Pereira Guerra, Jose Oscar Machado Alexandre, Olga Maria deOliveira, Flavio Roberto Dias Velasco, and Celso deRenna-Souza Jun. 1981 27 p In PORTUGUESE; ENGLISH summary Presented at the 14th National Cong. on Informatics SUCESU, Sao Paulo, Brazil, Oct. 1981

(INPE-2116-RPE/340) Avail: NTIS HC A03/MF A01

The RELATIONAL SYSTEM's languages designed for Burroughs' machines (series B7000/B6000) are introduced. The RELATIONAL SYSTEM was conceived to implement multipurpose relational data bases in the Burroughs' environment, using the DBMS software package, DMS-II, as a support tool. It offers to users a high-level nonprocedural query language, called SEQUEL2/QS, and usual languages as COBOL, ALGOL, and PL/I. J.M.S.

N82-18457# Martin Marietta Corp., Orlando, Fla.

LOS SELECTIVE FADING AND AN/FRC-170(V) RADIO HYBRID COMPUTER SIMULATION PHASE A REPORT Interim Report, Feb. - Sep. 1981

M. Keith Klukis, Thomas I. Lyon, and Randall Walker Sep. 1981 131 p

(Contract DCA100-81-C-0016)

(AD-A108747; OR-16956) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report documents results of the first phase of modeling, simulation and study of the dual diversity AN/FRC-170(V) radio and frequency selective fading line of sight channel. Both hybrid computer and circuit technologies were used to develop a fast, accurate and flexible simulation tool to investigate changes and proposed improvements to the design of the AN/FRC-170(V) radio. In addition to the simulation study, a remote hybrid computer terminal was provided to DCEC for interactive study of the modeled radio and channel. Simulated performance of the radio for Rayleigh, line of sight two ray channels, and additive noise are included in the report. Author (GRA)

N82-18458# Mission Research Corp., Santa Barbara, Calif.

THEORY OF EMP COUPLING IN THE SOURCE REGION Final Report, 1 Feb. 1979 - 28 Feb. 1980

Conrad L. Longmire and James L. Gilbert 28 Feb. 1980

216 p refs
(Contract DNA001-79-C-0186)
(AD-A108751; MRC-R-546; DNA-5687F) Avail: NTIS HC A10/MF A01 CSCL 20/14

This report presents methods, primarily analytical, for calculating the coupling of EMP to systems in the source region. The first chapter discusses Maxwell's equations and units. The second chapter presents an adequate model for the impedance of soils, and discusses causality and reality conditions on solutions in the domain of complex variables. The third chapter is a survey of EMP sources and fields for surface bursts. The remaining chapters discuss coupling to short buried conductors, long buried conductors, short vertical conductors in the air, and long elevated conductors. Author (GRA)

N82-18459# Pacific-Sierra Research Corp., Santa Monica, Calif.
INTEGRAL EQUATION APPROACH TO THE PROPAGATION OF LOW-FREQUENCY GROUNDWAVES OVER IRREGULAR TERRAIN. 2: TWO-DIMENSIONAL TERRAIN FEATURES AND ELEVATED RECEIVERS Final Technical Report, Oct. 1979 - May 1981
E. C. Field, Jr., S. Gayer, and B. Ambrosio Griffiss AFB, N.Y. RADC Oct. 1981 69 p refs
(Contract F19628-78-C-0088; AF Proj. 2304)
(AD-A108578; PSR-1113; RADC-TR-81-287) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report presents solutions of the one- and two-dimensional integral equations that describe groundwave propagation. Considered are the effects of: (1) terrain irregularities that are narrower than a Fresnel zone, and (2) receiver elevations. The results define the condition under which the simpler one-dimensional equation can be used, as well as those that demand the more complicated two-dimensional form. A frequency of 100 kHz is assumed throughout, although certain results are easily scaled to other frequencies. It is well known that the one-dimensional equation is invalid unless the terrain is nearly uniform across a Fresnel zone. It has been found that for obstacles narrower than about 10 km and typical path-lengths the one-dimensional equation erroneously predicts propagation anomalies that (1) are independent of width, and therefore too large, and (2) diminish too slowly at long distances. Considerable error can be incurred by applying the one-dimension equation to moderately sized terrain features. For example, for a path-length of 500 km, that equation overstates by a factor of four unless the diameter approaches a Fresnel zone width-which exceeds 10 km for long propagation paths. Even for wide obstacles, the one-dimensional formulation neglects reflection and interference phenomena. GRA

N82-18460# Pacific-Sierra Research Corp., Santa Monica, Calif.
CALCULATION OF IONOSPHERIC CONDUCTIVITY PROFILES BY INVERTING VLF/LV REFLECTIONS DATA. 1: ISOTROPIC PROPAGATION Final Technical Report, Oct. 1979 - May 1981
R. E. Warren, E. C. Field, Jr., and C. R. Warber Griffiss AFB, N.Y. RADC Oct. 1981 63 p refs
(Contract F19628-78-C-0088; AF Proj. 2304)
(AD-A108577; PSR-1114; RADC-TR-81-286) Avail: NTIS HC A04/MF A01 CSCL 04/1

This report presents an iterative method for inverting VLF/LF ionosounding data to obtain ionospheric conductivity profiles. The relationship between the detail that can be realized in the calculated profile and the quality and quantity of the reflection data is given explicitly. Only altitudes below about 70 km where the propagation can be assumed isotropic are considered, although the method can be extended to anisotropic propagation. The method is demonstrated by applying it to two qualitatively different ionospheric models: a strong SPE disturbance and a C-layer exhibiting a well-defined conductivity peak. Ground-level reflection data contain information only about those heights from which significant energy is returned. The calculated profiles agree well with the true profiles over the height range where the strongest reflections occur, and break down outside of that range. The solutions converge toward the true profiles despite the use of initial estimates that contain no information about the true ionospheric structure. The height resolution actually achieved for the two examples is much better than the theoretically predicted limit. Author (GRA)

N82-18461# IIT Research Inst., Chicago, Ill.
AN ASSESSMENT OF THE MAGNITUDE OF ELECTROMECHANICAL FAILURES OCCURING WITHIN AIR FORCE COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE (C3I) SYSTEMS Final Report, 1 Aug. 1980 - 31 May 1981
John E. Short Oct. 1981 42 p
(Contract F30602-78-C-0281; AF Proj. 2338)
(AD-A108203; RADC-TR-81-267) Avail: NTIS HC A03/MF A01 CSCL 17/2

The failure of mechanical or electromechanical components in systems and equipment does not have a direct bearing upon the operational reliability and the logistic support costs. The basic objective of this assessment was to obtain and review all readily available historical and statistical data on selected C3I systems and components. The second was to obtain through structured but informal discussions the opinions and observations of qualified experts in each phase of system planning, research, development, acquisition, operations and logistic support of C3I systems. GRA

N82-18462# Institute for Defense Analyses, Arlington, Va. Science and Technology Div.
A SURVEY OF THE LIMITS ON RADAR IMAGING Final Report
Irvin W. Kay Oct. 1981 63 p refs
(Contract MDA903-79-C-0202)
(AD-A108598; AD-E500447; IDA-P-1586; IDA/HQ-81-23521) Avail: NTIS HC A04/MF A01 CSCL 17/9

Theoretical limits on the performance of millimeter-wave radar imaging systems is explored. Recognition by shape and, as far as possible, identification of military targets on the ground is their purpose. It is concluded that, with the possible exception of synthetic aperture radar, such systems, using antennas of a practical size, cannot provide adequate resolution for imaging, as defined in the ordinary sense, tank-size targets over ranges of tactical interest. Target characteristics that effect image quality, the image quality needed for target recognition and identification, and the theoretical relations between optical system parameters and image properties such as depth of field and resolution are considered. Also considered are the appropriateness of various definitions of resolution that appear in the literature, distinctions that must be made between extended targets and point targets, and differences between coherent and incoherent illumination with respect to resolution. The possibility of improving image quality, particularly resolution, with the aid of superresolution techniques and apodization is also discussed. It also estimates possible reduction in the number of elements in a large antenna array using an optimum array thinning distribution of the elements. GRA

N82-18463# Rome Air Development Center, Griffiss AFB, N.Y.
TEST AND EVALUATION OF REDUCED RATE MULTIPLEXERS Report, Jan. - Dec. 1980
John Evanowsky Aug. 1981 38 p refs
(AF Proj. 2157)
(AD-A108202; RADC-TR-81-163) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report contains the results of a test and evaluation utilizing commercially available Reduced Rate Multiplexers performed by RADC's Digital Communication Experimental Facility (DICEF) in support of DCA/DCEC. Unlike previous work in this area, the subject program considered the effect of an analog telecommunications channel prior to digitization by a Continuously Variable Slope Delta Modulation (CVSD) encoder. The major conclusion drawn from this evaluation is the fact that a system incorporating a 32 KB/S CVSD in tandem with a conventional analog telephone channel of relatively poor quality can support 2400 B/S modem transmission. GRA

N82-18464# Rome Air Development Center, Griffiss AFB, N.Y.
TM/TE POLARIZATION RATIOS IN A SAMPLE OF 30 kHz SFERICS RECEIVED AT ALTITUDES FROM 0 TO 70 km
R. P. Harrison, E. A. Lewis, J. B. Donohoe (Megapulse, Inc.), and J. E. Rasmussen Aug. 1981 17 p refs
(AF Proj. 4600)
(AD-A108182; RADC-TR-81-235) Avail: NTIS

HC A02/MF A01 CSCL 20/14

A rocket-borne payload, carrying both veritcal and horizontal magnetic dipole antennas and receiving instrumentation, was flown from Wallops Island, Virginia, to observe the Transverse Electric (TE) and Transverse Magnetic (TM) polarization components of individual sferics at 30 kHz. During the 2-1/2 min flight to apogee at 96 km, 293 individual sferics were observed. Upon applying corrections for difference in azimuthal antenna patterns, it was concluded that the TM noise fields were larger than the TE fields by about 15 dB near the ground, and approximately equal at 60 km. Author (GRA)

N82-18465# Rome Air Development Center, Griffiss AFB, N.Y.
MEASUREMENTS OF ANTENNA PULSE RESPONSE
Paul R. Caron Jul. 1981 53 p
(AF Proj. 4600)
(AD-A108181; RADC-TR-81-224) Avail: NTIS HC A04/MF A01 CSCL 09/1

A technique for obtaining the pulse response of antennas utilizing steady-state measurements on a Scientific-Atlanta 2020 antenna range is described. The method involves making wideband frequency measurements, both amplitude and phase, centered about the defined carrier frequency and transforming the data to low frequency. This result is multiplied by the complex Fourier Transform of a pulse (the modulating pulse) utilizing Fast-Fourier-Transforms and the inverse FFT yields the desired pulse response. All computations are done on the 2020 System Computer (Hp 21 MX Series 1000). Techniques for eliminating the frequency response of system components are described. The technique essentially treats the antenna on a 'transfer function' basis. Therefore, results are presented on the response of a transmission line system and this is compared with theory. Finally, results on the pulse response of various antennas are presented. Author (GRA)

N82-18466# Analysis and Technology, Inc., North Stonington, Conn.
EVALUATION OF TWO AN/APS-94 SIDE-LOOKING AIRBORNE RADAR SYSTEMS IN THE DETECTION OF SEARCH AND RESCUE TARGETS Interim Report, Jan. 1978 - Aug. 1981
S. R. Osmer, N. C. Edwards, Jr., G. L. Hover, and T. J. Mazour Aug. 1981 163 p refs
(Contract DTCG39-80-C-80052)
(AD-A108404; USCG-D-64-81) Avail: NTIS HC A08/MF A01 CSCL 17/9

Side-Looking Airborne Radar (SLAR) detection data were gathered in conjunction with four visual detection experiments designed to improve search planning guidance contained in the National Search and Rescue Manual. HC-130 aircraft, equipped with either the Airborne Oil Surveillance System (AOSS) or SLAR/radar image processor (SLAR/RIP) configuration of the AN/APS-94C or D SLAR, conducted controlled searches for life rafts, small boats, and 41- to 95-foot Coast Guard vessels in Block Island Sound or open ocean. Using a microwave tracking system and SLAR data, the positions of searchers and targets were accurately reconstructed to facilitate the verification of detections on SLAR films or video tape. These data were used to evaluate the effects of environmental and controllable parameters on SLAR detection of the various target types. Target size/composition search altitude, swell height, wind speed, and humidity/precipitation were found to have a significant influence of SLAR detection performance. Upper-bound lateral range curves and sweep widths for SLAR search are included. Real-time performance tests for AN/APS-94D SLAR and system performance tests for new SLARs (AN/APS-131) are recommended. GRA

N82-18467# Army Test and Evaluation Command, Fort Huachuca, Ariz.
ENGINEERING INTELLIGIBILITY TESTING OF VOICE COMMUNICATION EQUIPMENT Final Report
19 Nov. 1981 15 p refs Supersedes MTP-6-2-521
(AD-A108138; TOP-6-2-521; MTP-6-2-521) Avail: NTIS HC A02/MF A01 CSCL 17/2

Engineering test methods and procedures for evaluating the intelligibility of voice communication equipment are described. Two types of testing, phonetically balanced word list testing and automatic testing by means of the Voice Intelligibility Analysis System are addressed. GRA

N82-18468# Air Force Geophysics Lab., Hanscom AFB, Mass. Aerospace Instrumentation Div.
DEVELOPMENT OF A LOW DATA RATE REPEATER Final Report
Hans Laping and C. Rice, ed. 30 Jan. 1981 26 p refs
(AF Proj. 7659)
(AD-A108154; AFGL-TR-81-0019; AFGL-IP-298) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes a 40 MHz to S-Band data repeater developed to increase the radio horizon for high altitude scientific balloon flights launched from Holloman AFB in New Mexico. Author (GRA)

N82-18469# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Ice Engineering Research Branch.
ELECTROMAGNETIC SUBSURFACE MEASUREMENTS
Arnold M. Dean, Jr. Oct. 1981 24 p
(Proj. CWIS-31350)
(AD-A108192; CRREL-SR-81-23) Avail: NTIS HC A02/MF A01 CSCL 17/9

In 1974, personnel at the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) began using an impulse radar system to profile accumulations of ice forms. The system was modified for effective use as a profiling system in a ground or airborne configuration, in certain high-noise environments. The system can penetrate fresh water and media with a high water content. Frazil and brash ice accumulations with approximately 50% water were profiled to a depth of 25 to 35 ft. As a result of the CRREL modifications, the system has found extensive and varied applications as a low-level remote sensing tool. Applications include profiling ice accumulations (including ice jams), river beds, sheet ice, permafrost, subsurface ice masses, river bank revetments through air-entrained water, snow covers, sea ice, icebergs, and peat bogs. Limited laboratory work has also shown that the impulse radar system may be able to detect oil and gas under sea ice. Selected applications and data are presented. Since it was used mainly for research, the CRREL system needs further development to make it useful to operational units. Additional development of hardware and software is recommended. GRA

N82-18470# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONE CLASS OF OPTIMUM LINEAR EQUALLY SPACED ANTENNA ARRAYS WITH SUMMARY OF DIFFERENCE RADIATION PATTERNS
B. M. Minkovich 6 Nov. 1981 32 p refs Transl. into ENGLISH from Antenny (USSR), 1970 p 3-17
(AD-A108176; FTD-ID(RS)T-1135-81) Avail: NTIS HC A03/MF A01 CSCL 20/14

One Class of Optimum Linear Equally Spaced Antenna Arrays with Summary or Difference Radiation Patterns--Translation. GRA

N82-18471# Strategic Air Command, Offutt AFB, Nebr. Aircraft Engineering Div.
AN/ALQ-135 TAIL WARNING SYSTEM FOLLOW-ON OPERATIONAL TEST AND EVALUATION Final Report
Vincent M. Jenkins 23 Nov. 1981 5 p
(AD-A108348; SAC/LGME-P-405) Avail: NTIS HC A02/MF A01 CSCL 15/3

This is a study of the reliability and maintainability of the tail warning system (TWS) AN/ALQ-153. This TWS is a solid state pulsed Doppler radar designed to provide warning and initiate countermeasures against threats attacking from the tail of B-52G/H aircraft. Author (GRA)

N82-18472# Naval Research Lab., Washington, D. C. Center for Space Research.
MULTIPATH VLF PROPAGATION EFFECTS ON CORRELATION RECEIVERS
Francis J. Kelly, J. P. Hauser, H. M. Beck, and F. J. Rhoads 18 Sep. 1981 52 p refs
(AD-A108408; NRL-8521) Avail: NTIS HC A04/MF A01 CSCL 20/14

The effect of electromagnetic propagation at very low frequency in the Earth ionosphere waveguide can distort wideband communication waveforms and produce a splitting of the correlation peak of the received signal at a model interference null where multipath signals arrive out of phase. Propagation from an inclined dipole antenna trailed behind an orbiting aircraft can cause split correlation pattern to fluctuate throughout the orbit period. For the case of an MSK (minimum-shift-keying) signal format, expressions and graphs are given for the correlation vector, as a function of receiver synchronization time and aircraft flight direction. Author (GRA)

N82-18473# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ELECTROMAGNETIC COUPLING TO A CONDUCTING BODY OF REVOLUTION WITH A HOMOGENEOUS MATERIAL REGION
Joseph R. Mautz and Roger F. Harrington Griffiss AFB, N.Y. RADC Jul. 1981 66 p refs
(Contract F30602-79-C-0011; AF Proj. 2338)
(AD-A108395; RADC-TR-81-202) Avail: NTIS HC A04/MF A01 CSCL 20/3

A numerical solution for electromagnetic coupling to a perfectly conducting body of revolution with a loss-free homogeneous material region is developed. The material region is exposed by a rotationally symmetric aperture in the conducting body. Application of the equivalence principle introduces an unknown electric current on the surface of the conducting body, and both an unknown equivalent electric current and an unknown equivalent magnetic current in the aperture. These currents satisfy the integral equations obtained by annihilating the tangential components of the electric field on the surface of the conducting body and by enforcing continuity of the tangential components of the electric and magnetic fields across the aperture. These integral equations are solved numerically by means of the method of moments. Numerical results are presented for four different conducting bodies, each of which has a dielectric region and is excited by an axially incident plane wave. The computer program used to calculate these currents allows for the more general case of oblique incidence. GRA

N82-18474# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
MULTIPLE ACCESS COMMUNICATION: THE FINITE USER POPULATION PROBLEM Ph.D. Thesis
Michael Gene Hluchyj Nov. 1981 146 p refs
(Contract N00014-75-C-1183; ARPA Order 3045)
(AD-A108337; LIDS-TH-1162) Avail: NTIS HC A07/MF A01 CSCL 17/2

The multiple access problem is one of organizing a population of users so that they may efficiently share the resources of a single communication channel. This problem is examined under the modeling assumptions of a finite user population and a time slotted channel with limited feedback. Techniques of schemes for coordinating the transmissions of users are called multiaccess protocols. Simple relationships among common steady state measures of protocol performance (including throughput and average delay) are derived. It is shown that the performance measures are equivalent in the sense that (1) each may be expressed as a simple function of any one of the others and (2) a protocol which is optimal with respect to any one measure is optimal with respect to the others. The derived relationships are also used in the performance analysis of perfect scheduling and TDMA. Four related classes of multiaccess protocols are defined, examined, and an optimal protocol is characterized. The optimization problem is formulated as a Team problem for three classes. Using results from Markov decision theory, optimal window protocols are derived for the cases of two and three users. GRA

N82-18475# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
QUEUEING ANALYSIS OF A SHARED VOICE-DATA LINK Ph.D. Thesis
Daniel Uri Friedman Nov. 1981 165 p refs
(Contract N00014-75-C-1183; ARPA Order 3045)
(AD-A108336; LIDS-TH-1161) Avail: NTIS HC A08/MF A01 CSCL 17/2

We consider a link shared by some number of off-hook phone callers and a data queue. The allocation of capacity to voice and data depends on the level of speaker activity (number of talkspurt). A Markov chain model is adopted for this activity, and the resulting data queue performance is analyzed. Author (GRA)

N82-18476# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A PROPAGATION EXPERIMENT INVOLVING REFLECTION AND DIFFRACTION
M. Littleton Meeks 26 Oct. 1981 25 p refs
(Contract F19628-80-C-0002; ARPA Order 3724)
(AD-A108644; CMT-18; ESD-TR-81-289) Avail: NTIS HC A02/MF A01 CSCL 17/9

Measurements of propagation at a frequency of 1090 MHz over terrain that produces specular reflection and knife-edge diffraction are in good agreement with model calculations that use images to represent the effect of reflection. A hill covered with a pine forest formed the diffracting mask, and an airport area formed the reflecting surface. Agreement between measurements and model calculations required that the diffracting knife-edge be located at treetop level. Optimum propagation into the shadow region was obtained when a maximum in the reflection-lobe pattern coincided with the mask angle. Author (GRA)

N82-18477# Nebraska Univ., Lincoln. Dept. of Mathematics.
TRANSIENT FIELDS PRODUCED IN HETEROGENEOUS BODIES BY ELECTROMAGNETIC PULSES Final Report, 8 May - 30 Sep. 1980
Robert J. Krueger Brooks AFB, Tex. SAM Oct. 1981 82 p refs
(Contract F33615-78-D-0629; AF Proj. 7757)
(AD-A108500; SAM-TR-80-12) Avail: NTIS HC A05/MF A01 CSCL 20/14

An exact analytical technique for determining induced electromagnetic fields in a one dimensional medium is developed. The incident field, which impinges normally on the medium, is an electromagnetic pulse of arbitrary shape and duration. The medium is of finite depth and can have arbitrarily specified and nonconstant permittivity and conductivity. This analytical result is implemented in a computer program called HATS (High Accuracy Temporal Solution), which is virtually free of numerically dispersion. Several sample problems are formulated and then solved via this program. Appendix B supplies a manual that details use of the program and includes a source listing of HATS, sample input, and plots. Author (GRA)

N82-18478# California Univ., Los Angeles.
THEORETICAL AND EXPERIMENTAL INVESTIGATION OF SOME SLOT ANTENNA ARRAY PROBLEMS Final Technical Report, 1 Feb. 1979 - 7 Mar. 1981
R. S. Elliott, N. G. Alexopoulos, G. Franceschetti, P. J. Contoyannis, and P. Park Griffiss AFB, N.Y. RADC Oct. 1981 122 p refs
(Contract F19628-79-C-0069; AF Proj. 2305)
(AD-A108566; RADC-TR-81-232) Avail: NTIS HC A06/MF A01 CSCL 09/5

The effect of metallic fences on mutual coupling between slots of a slot antenna is studied. A model solution has been obtained whereby the fence is modelled as a thin half elliptic cylinder. This model allows for thickness to be taken into account and provides exact solutions to mutual impedance computations. The geometrical theory of diffraction has been adopted to analyze an exceedingly thin fence, when the slot antennas are not too close to the fence. Design procedures for longitudinal and traverse stripline-fed slots have been developed. A design procedure for such slot arrays requires knowledge of the mutual coupling relation as well as the self-impedance properties of a slot. Preliminary design equations are reported in this document. Author (GRA)

N82-18479# Centre de Recherches en Physique de l'Environnement Terrestre et Planetaire, Orleans (France). Dept. GES.
WAVE NORMAL DIRECTIONS AND WAVE DISTRIBUTION FUNCTIONS FOR GROUND BASED TRANSMITTER SIGNALS OBSERVED ON GEOS 1
F. Lefeuvre, T. Neubert (Danish Research Inst.), and M. Parrot

Mar. 1981 75 p refs Sponsored by Danish Natural Science Research Council, CNRS and NSF
(CRPE-NT-99) Avail: NTIS HC A04/MF A01

Methods for determining the wave normal direction of electromagnetic wave fields observed in space from the simultaneous measurement of part or all of six wave components are assessed. Crossproduct method, Means's method, and maximum entropy method predictions are compared for 7 nearly successive 1 sec whistler mode pulses at 10.2 and 11.33 kHz observed onboard Geos 1. Signal to noise ratio, stationarity, degree of polarization, and polarization value are considered. For plane wave signals, signal to noise ratio is the key parameter for the crossproduct method. For highly polarized waves, polarization value deduced from a spectral matrix, is the key parameter for Means's method and the maximum entropy method. Wave type does not greatly influence results. Methods based on the spectral matrix are subject to estimation errors, but must be used if the electromagnetic field is of the plane wave type and the signal to noise ratio is high. Author (ESA)

N82-18480# Ferranti Ltd., Bracknell (England).
ANALOGUE SAR SIGNAL PROCESSING: BREADBOARD DESIGN, IMPLEMENTATION, EVALUATION AND COMPONENT SPECIFICATION Final Report
K. M. Harvey, M. A. B. Hugues, C. Lambert, D. W. Sergeant, and D. W. Cruse Paris ESA Mar. 1981 158 p refs
(Contract ESA-3400/77/NL-HP(SC))
(ESA-CR(P)-1463; Rept-3976-ISSUE-1) Avail: NTIS HC A08/MF A01

The architecture, design and implementation of prefilter/subaperture filter and azimuth correlator breadboards of an onboard satellite SAR system are described. The signal generation and output data logging units used in tests are presented. The prefilter frequency response was tested by passing sinusoidal signals of varying frequency through the filter. A linearity test and a simulated point target chirp signal test were performed. The azimuth correlator was tested using a point target, a ramp, and a hole (zero reflectivity block in the center of a reflective background). Results show that charge coupled devices (CCD) are suitable for satellite applications, but given the advent of technologies, such as switched capacitor filters, a mixed approach (with CCD used only for imaging and programmable transversal filters) is advocated. Author (ESA)

N82-18481# Thomson-CSF, Meudon-la-Foret (France). Dept. Espace-Satellites.
STUDY OF SYNTHETIC APERTURE RADAR IN 2D - 2FS OPERATION OVER THE OCEAN Final Report
Paris ESA 5 Mar. 1981 25 p
(Contract ESA-4586/81/F-DD(SC))
(ESA-CR(P)-1475) Avail: NTIS HC A02/MF A01

Synthetic aperture radar operation (imaging mode) for the European Remote Sensing program is considered. The 2D - 2FS function consists in operating in a low power mode (100 W RF) for 1.5 sec every 15 sec in order to image patches on the sea surface of 5 km by 5 km every 100 km, with the 5 km squares in the center of the beam. The data stream needs to be buffered such that a continuous (300 kbit/sec) data stream is delivered. The impact of such a mode on hardware, especially in terms of mass and power consumption, was studied. Results show that the 2D - 2FS option requires minor changes. One additional dispersive line and one additional box, containing the added hardware for data handling, are necessary. This represents 7 kg more (with redundancy) for payload. The average power consumption in wave mode becomes 150 W.
Author (ESA)

N82-18482# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
SIMULATION OF MODERN RADAR APPARATUS IN FULL MISSION FLIGHT AND TACTIC SIMULATORS [SIMULATION MODERNER RADARANLAGEN IN FULL-MISSION-FLUG- UND TAKTIKSIMULATOREN]
G. Werner 7 May 1981 23 p In GERMAN Presented at DGLR Symp., 20-21 May 1981
(MBB-UA-585-81-O; DGLR-81-103) Avail: NTIS HC A02/MF A01

Simulation of modern radar equipment on a full mission flight and tactics simulator are described. Implementation of hardware and software is illustrated by digital radar systems for landmasses, tornado flight simulation, and tactics simulator.
Transl. by E.A.K.

N82-18483# European Space Agency, Paris (France).
VOLUMETRIC PATTERN PREDICTION OF ANTENNAS ON AIRCRAFT USING THE GEOMETRICAL THEORY OF DIFFRACTION Ph.D. Thesis - Kaiserslautern Univ.
Thomas Jank Oct. 1981 146 p refs Transl. into ENGLISH of "Bestimmung des raeumlichen Strahlungsdiagramms von Antennen auf Flugzeugen mittels des geometrischen Beugungstheorie", Rept. DFVLR-FB-80-01 DFVLR, Oberpfaffenhofen, West Germany, Nov. 1979
(ESA-TT-677; DFVLR-FB-80-01) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 29,90

High frequency radiation patterns of aircraft dipole and slot antennas are calculated using the geometrical theory of diffraction (GTD). A mathematical model of an aircraft is presented. Arbitrary pattern sections are obtained by solving the ray tracing problem for rays which contribute significantly to the total field. Storage techniques and integration methods for the ray tracing problem (a boundary value problem) are discussed. Comparison with measured results obtained from physical models validate the use of the GTD and model. Author (ESA)

N82-18484# European Space Agency, Paris (France).
THE INFLUENCE OF THE ATMOSPHERE ON MICROWAVE RADIOMETRIC MEASUREMENTS IN THE 10 GHz TO 400 GHz FREQUENCY RANGE
Juergen Preissner Sep. 1981 52 p refs Transl. into ENGLISH of "Einfluss der Atmosphaere auf mikrowellenradiometrische Messungen im Frequenzbereich von 10 GHz bis 400 GHz" Rept. DFVLR-Mitt-80-16 Oberpfaffenhofen, West Germany, Sep. 1980 54 p
(ESA-TT-706; DFVLR-Mitt-80-16) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 11,30

The influence of the atmosphere on the brightness temperature of ground based objects, the reflectivities of which are known, is discussed. Attenuation caused by atmospheric gases and hydrometeors (rain, fog, clouds, snow) is described in detail. Given this attenuation, a computer program for the radiometric transfer equation was compiled. The possibility of determining the brightness temperature for any object on the ground and for any position of the sensor is shown. The brightness temperature was computed for 38 different frequencies in the range of 10 GHz to 400 GHz, for two viewing angles (zero and 60 deg), for six different heights of the sensor between 100 and 8000 m, for 19 different weather conditions, and for 41 different reflectivities of objects. The results are presented as diagrams. Author (ESA)

N82-18485# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Hochfrequenztechnik.
A REVIEW OF SATELLITE COMMUNICATION AND PROPAGATION EXPERIMENTS FOR FREQUENCIES ABOVE 10 GHz
Palavalli Naranaiah Radhakrishnaiah Setty (Indian Space Research Organization, Ahmedabad) Nov. 1980 163 p refs
(DFVLR-Mitt-81-08) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 33,50

The effects of constituents of the atmosphere, such as hydrometeors and gases, which attenuate, scatter, depolarize, and phase distort electromagnetic radiation are considered. Satellite communication and propagation experiments, using onboard beacons and/or transponders, provide data for modeling these effects as a function of meteorological parameters. Pertinent experiments are reviewed, emphasizing innovations in experiment configurations and spacecraft hardware. These are: ATS 5 and 6 propagation and communication experiments; satellite 19 and 28 GHz beacon propagation experiment; Communication Technology Satellite experiments; ETS-2 propagation experiment; SIRIO propagation and communication experiment; and OTS communication and propagation experiments. The Japanese satellite experimental program is also covered. Author (ESA)

N82-18486# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.

ON THE ELECTROMAGNETIC PLANE WAVE SCATTERING FROM A WIRE GRID WITH RHOMBIC CELLS
V. Akimov and P. Pesari 1979 12 p refs
(Rept-S-114; ISBN-951-751-703-3) Avail: NTIS HC A02/MF A01

The reflection coefficients from a wire grid with rhombic cells located over the ground were derived, including the cross polarized components. The cells of the grid were assumed to be small compared with the free space wavelength, and the spacing between the grid and the ground was assumed to be larger than the dimension of the cells. Some numerical results are presented to illustrate the effects of various parameters. The method of averaged boundary conditions was used for the derivation. Author (ESA)

N82-18487# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
ON THE QUASI-TEM MODES IN GENERAL MULTICONDUCTOR TRANSMISSION LINES
Ismo V. Lindell 1980 14 p refs
(Rept-S-118; ISBN-951-752-076-X) Avail: NTIS HC A02/MF A01

The general inhomogenous shielded N-conductor transmission line is considered and several properties for the quasi-TEM modes were derived. The concept of quasi-TEM was deduced through an asymptotic series expansion of the fields. Conditions for the propagation constant and for the construction of the field are presented. The problem is shown to be reduced to two static two-dimensional boundary value problems. The concepts of propagating modes and impedance modes were introduced and shown not to be the same in the general case. The special cases of propagating impedance modes are discussed and shown to exist under certain symmetry conditions of the multiconductor line. Author (ESA)

N82-18488# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
ASYMPTOTIC HIGH FREQUENCY MODES OF HOMOGENEOUS WAVEGUIDE STRUCTURES WITH IMPEDANCE BOUNDARIES
Ismo V. Lindell 1980 21 p refs
(Rept-S-120; ISBN-951-752-182-0) Avail: NTIS HC A02/MF A01

Homogeneous waveguides with both isotropic and anisotropic impedance boundaries were considered. Asymptotic high frequency mode properties were derived systematically. Several expressions showing the orthogonality properties of the asymptotic high frequency fields were deduced and duality transformations satisfying certain requirements were considered. Self-dual solutions corresponding to the two duality transformations are demonstrated and stationary functionals are constructed. An explicit formula for the calculation of the asymptotic attenuation coefficient for the general waveguide is given, isotropic and anisotropic boundaries being considered separately. Attenuation properties of a corrugated waveguide are used as an example. Author (ESA)

N82-18489# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
BACKGROUND VARIATIONS IN MILLIMETER WAVE TELESCOPES DUE TO THE RADOME STRUCTURE
Martty Tiuri and Seppo Urpo 14 Aug. 1980 8 p Presented at URSI Symp. on Millimeter Wave Technol., Grenoble, France, 1980
(Rept-S-121; ISBN-951-752-183-9) Avail: NTIS HC A02/MF A01

The difference between measured and theoretical standard deviations of atmospheric fluctuations in radome covered telescopes used in dual beam radio source flux measurements is discussed. The main reason for this increased deviation is shown to be background noise from the telescope surroundings, which is reflected from the radome frame. A so-called synchronous tracking method is introduced for eliminating the effect of the background. A higher tapering of the feed horn is possible, but lowers the total efficiency of the telescope. Author (ESA)

N82-18490# Research Inst. of National Defence, Linkoeping (Sweden). Radio Lab.
RADIO EQUIPMENT FOR PROPAGATION EXPERIMENTS AT THE FREQUENCIES 11, 18, AND 36 GHz [RADIOUTRUSTNING FOER VAAGUTBREDNINGSUNDERSOEKNINGAR VID FREKVENSERNA 11,18 OCH 36 GHz]
Bernt Danielsson and Lennart Nilsson May 1981 87 p refs In SWEDISH
(FOA-A-30027-E2; R1-1014/81) Avail: NTIS HC A05/MF A01

A program which tests the suitability of frequencies above 10 GHz for telecommunications is described. Atmospheric and climatic effects are studied. Output is unmodulated CW on seven frequencies, received simultaneously at one site. In 4 cases the intensities of the horizontally and vertically polarized components are recorded separately, giving 11 receiver channels. One single and one dual polarization antenna are used. The tests run for three years. No permanent damage should result from operation at ambient indoor temperatures > 50 C; 100% humidity; and AC voltage variation from 0% to 120% of nominal. No results are available. Author (ESA)

N82-18491# Science Research Council, Chilton (England).
THREE DIMENSIONAL FIELD COMPUTATION
C. W. Trowbridge 1981 10 p refs
(PB82-107160; RL-81-054) Avail: NTIS HC A02/MF A01 CSCL 20C

Recent research work carried out at Rutherford and Appleton Laboratories into the Computation of Electromagnetic Fields is summarized. The topics covered include algorithms for integral and differential methods for the solution of 3D magnetostatic fields, comparison of results with experiment and an investigation into the strengths and weaknesses of both methods for an analytic problem. The paper concludes with a brief summary of the work in progress on the solution of 3D eddy currents using differential finite elements. GRA

N82-18492# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 2300-2450 MHz BAND
Robert T. Watson Sep. 1981 70 p refs
(PB82-115452; NTIA/Rept-81-78) Avail: NTIS HC A04/MF A01 CSCL 17B

Spectrum resource assessment of the 2300-2450 MHz band is presented. Information rules and allocations, technical standards, frequency assignments, system characteristics and deployment, and an evaluation of applicable compatibility analyses are included. Present spectrum management techniques and associated problems and issues were identified by considering the interaction of the various systems for the allocated services. Recommendations were provided to exclude the amateur service and high power airborne radars from the 2310-2390 MHz band to assure compatibility with telemetry systems. Continuing study of the proposed Satellite Power System was also recommended. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-18493* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
APPARATUS FOR DAMPING OPERATOR INDUCED OSCILLATIONS OF A CONTROLLED SYSTEM Patent
John W. Edwards and John W. Smith, inventors (to NASA) Issued 3 Nov. 1981 13 p Filed 29 Feb. 1980 Supersedes N80-20488 (18 - 11, p 1409)
(NASA-Case-FRC-11041-1; US-Patent-4,298,833; US-Patent-Appl-SN-126064; US-Patent-Class-318-561; US-Patent-Class-318-620; US-Patent-Class-318-621; US-Patent-Class-318-622) Avail: US Patent and Trademark Office CSCL 09C

Flight control-related apparatus for damping operator induced oscillations of a controlled system responding to an operator controlled signal is described. The device utilizes a lag-lead filter for frequency and amplitude estimation of the control input, and a rectification and smoothing filter for producing a signal proportional to the absolute value of the frequency and amplitude estimate for use in suppression of the control system output signal. In one embodiment, this is accomplished by computing a correction signal in a correction generating section. In a second embodiment, a second rectification and smoothing filter produces a signal proportional to the absolute value of the controlled input signal. A ratio of the outputs of the first and second rectification and smoothing filters is then used in a generator to generate a gain factor k sub q for the control system to reduce the gain of the output signal of the control system, thereby to provide a damped control output signal without rate limiting the controlled element.

Official Gazette of the U.S. Patent and Trademark Office

N82-18494* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
POWER CONVERTER Patent
James M. Black, inventor (to NASA) Issued 3 Nov. 1981 7 p Filed 29 Jun. 1979 Supersedes N79-27395 (17 - 18, p 2399) (NASA-Case-FRC-11014-1; US-Patent-4,298,926; US-Patent-Appl-SN-053652; US-Patent-Class-363-132; US-Patent-Class-363-61; US-Patent-Class-363-17; US-Patent-Class-331-113R) Avail: US Patent and Trademark Office CSCL 09A

A dc-to-dc converter employs four transistor switches in a bridge to chop dc power from a source, and a voltage multiplying diode rectifying ladder network to rectify and filter the chopped dc power for delivery to a load. The bridge switches are cross coupled in order for diagonally opposite pairs to turn on and off together using RC networks for the cross coupling to achieve the mode of operation of a free running multivibrator, and the diode rectifying ladder is configured to operate in a push-pull mode driven from opposite sides of the multivibrator outputs of the ridge switches. The four transistor switches provide a square-wave output voltage which as a peak-to-peak amplitude that is twice the input dc voltage, and is thus useful as a dc-to-ac inverter.

Official Gazette of the U.S. Patent and Trademark Office

N82-18495 Dayton Univ., Ohio.
SINGLE PHASE PERMANENT MAGNET SYNCHRONOUS MOTORS Ph.D. Thesis
William Urban Borger 1981 259 p refs
Avail: Univ. Microfilms Order No. 8127849

A generalized technique was developed which permits simulation of unsymmetrical machinery. The technique allows for unbalanced stator voltages, with artibrary displacement angles, independent phase parameters, machine resistances which are functions of frequency, switching of phase voltages (opening and closing) as required and switching of starting circuits as functions of motor rpm. A 1-phase induction machine was studied in detail. Synchronization was studied for a 2-phase permanent-magnet motor running on 1 phase. Synchronization for this same motor was also studied assuming load connection via a spring type coupling. In addition to synchronization studies, a minor effort was undertaken to determine machine behavior during load application and removal. The machine studied in the synchronization effort was also analyzed in the load application/removal studies. Dissert. Abstr.

N82-18496 Ohio State Univ., Columbus.
FABRICATION AND CHARACTERIZATION OF OHMIC CONTACTS MADE WITH GOLD ON HEAVILY TIN DOPED N TYPE SURFACE LAYERS IN GALLIUM ARSENIDE Ph.D. Thesis
Timothy Lee Deeter 1981 212 p
Avail: Univ. Microfilms Order No. 8128986

The fabrication of non-alloyed, ohmic Au-GaAs contacts was studied. Experimental data on contact resistivity and current-voltage response was compared with theoretical predictions to determine the applicability of the tunneling Schottky barrier model to the analysis of ohmic contacts. Non-alloyed, tunneling contacts were fabricated by evaporating Au onto an n-type layer with a high dopant surface concentration made by diffusing Sn into a GaAs wafer. The value of dopant surface concentration was determined using an Irvin curve and a measurement of diffused layer resistivity. Schottky barrier height was determined from the current-voltage response of the contact. Values of surface concentration and barrier height were used to calculate theoretical values of contact resistivity to which experimental data was compared. It was found that the Schottky barrier model incorporating electron tunneling can accurately characterize non-alloyed contact performance implying that tunneling responsible for contact ohmicity. Dissert. Abstr.

N82-18497 Old Dominion Univ., Norfolk, Va.
A METHOD OF MODELING MULTIRATE TWO-DIMENSIONAL RECURSIVE DIGITAL FILTERS Ph.D. Thesis
Albert Peter Gerheim 1981 74 p
Avail: Univ. Microfilms Order No. 8128306

A method of modeling two dimensional sampled data systems with two sampling rates in each dimension is presented and applied to the problem of synthesizing two dimensional velocity filters using one dimensional prototypes and multirate concepts. The modeling method includes the replacement of scalar z-transforms of signals by vectors of polynomials, and the replacement of scalar z-transforms of impulse responses by matrices of polynomials. The synthesis of velocity filters is accomplished through the use of coordinate transformations in the z-transform domain which skew the omega (sub 1)-omega (sub 2) axes on the unit bidisc. The filters synthesized using these methods operate at sampling rates higher than the input and output data rates. The process of interpolating the input to accommodate the increase in sampling rates is analyzed in the frequency domain. This overall methodology is applied to the synthesis of fan filters of arbitrary order. Simple synthesis and realization methods are given. Dissert. Abstr.

N82-18498 California Univ., Berkeley.
SILICON MESFETS Ph.D. Thesis
Cornelis Dietwin Hartgring 1981 175 p
Avail: Univ. Microfilms Order No. 8200129

The potential of silicon metal-semiconductor field effect transistors (MESFETs) as a high-speed low-power integrated circuit technology is investigated. The device physics of submicron MESFETs and the modeling of their characteristics is emphasized. Two device models are derived, one of which was implemented in the integrated circuit simulation program SPICE2 and is now publicly available. The circuit techniques in the MESFET technology are investigated by means of SPICE2 simulations and experimental divide-by-two and ring oscillator circuit performances. The optimum circuit techniques are applied in the design of some LSI circuits: a 1 x 1K bit static shift register and parallel multipliers (8 x 8 bit and 10 x 10 bit). Their experimental and simulated performances are presented. The silicon MESFET technology is compared to the MOSFET and bipolar technologies for both present device dimensions and scaled-down ones. Dissert. Abstr.

N82-18499 California Univ., Berkeley.
PERFORMANCE OF FIR ADAPTIVE FILTERS USING RECURSIVE ALGORITHMS Ph.D. Thesis
Michael Latham Honig 1981 357 p
Avail: Univ. Microfilms Order No. 8200139

Adaptive digital filters used for speech and data processing are investigated. The algorithms use either a least mean square recursively in time. Only the all-zero transversal and lattice filter structures are considered. A geometric or Hilbert space formalism is used to derive the LMS lattice, LS lattice, and 'Fast' Kalman algorithms in a cohesive manner. Convergence properties of the LMS adaptive lattice filter are discussed. A deterministic model for multistage convergence is described which gives filter coefficient mean-values an output mean squared error as functions of time. The model is then extended to the LMS and LS lattice joint process estimators and to the 'Fast' Kalman algorithm. In each case calculated curves obtained from the model are compared with simulation results. The performance of each adaptive predictor in the context of adaptive differential pulse code modulation of speech is compared. Dissert. Abstr.

N82-18500 California Univ., Berkeley.
CHARGE CIRCUITS FOR ANALOG LSI Ph.D. Thesis
Robert Howard McCharles 1981 129 p
Avail: Univ. Microfilms Order No. 8200198

Large Scale Integration (LSI) reduced the cost of digital circuits, but had less effect on the cost analog circuits. A charge circuit, a clocked analog circuit which reduces these difficulties is discussed. A clock is used as a reference for time-dependant functions. A clocked analog inverter is a charge circuit similar to a digital gate. Any analog function can be implemented using analog storage and clocked analog inverters. Charge circuits were designed from algorithmic representations of desired functions allowing the use of self-correcting algorithms for improved accuracy. This reduced the need for trimming. A suitable technology for implementing charge circuits is MOS technology. A promising application is in analog-to-digital converters using recursive implementations. Error correcting algorithms can be applied to improve the accuracy of recursive (or cyclic) analog-to-digital converters. It is possible to construct such a converter as CMOS technology with greater than 12-bits of accuracy and a conversion time of less than 200 microseconds. Such a converter would have an active die area of 3 mm. square or less using present-day layout rules. Dissert. Abstr.

N82-18501 California Univ., Berkeley.
A UNIFIED CAD MODEL FOR MOSFETS Ph.D. Thesis
Sally Liu 1981 262 p
Avail: Univ. Microfilms Order No. 8200190

The operation of metal oxide semiconductor field effect transistors was analyzed, emphasizing the effects of quantum-mechanical statistics, the joining of strong- and weak-inversion regions and the modeling of small-geometry devices. Numerical evaluation of the drain current, channel conductance etc., based upon quantum-mechanical statistics, demonstrates that quantum-mechanical statistics alone do not result in a significant deviation from the classical prediction of these device characteristics within practical operational voltage ranges. Program TWIST was developed to simulate the characteristics of weak inversion and weak-injection punchthrough by solving the two-dimensional Poisson equation. The results of two-dimensional simulations establish the relationship between the drain-induced lowering of the surface barrier and the punch-through. The onset voltage of the punchthrough is derived from a quasi one-dimensional Poisson equation. To model small geometry devices, a semi-empirical model, MOS3, was developed and installed into the circuit simulation program SPICE2.G.
Dissert. Abstr.

N82-18502 California Univ., Berkeley.
JUMP BEHAVIOR OF CIRCUITS AND SYSTEMS Ph.D. Thesis
Sosale Shankara Sastry 1981 115 p
Avail: Univ. Microfilms Order No. 8200262

With particular reference to circuits, the jump behavior, that is, the seemingly discontinuous change in state of systems driven by constrained (or implicitly defined) dynamics is studied, i.e., $x = f(x,y), 0 = g(x,y)$. To be specific, dynamics of a circuit are defined implicitly by specifying the velocities (time derivatives) of capacitor voltages and inductor currents as well as the nonlinear resistive and Kirchhoff constraints that the branch voltages and currents must satisfy. These constraints represent a constraint manifold over the base space of capacitor voltages and inductor currents. The process of integrating the circuit dynamics to obtain the transient response of the circuit consists of 'lifting' the specified velocities to a vector field on the constraint manifold ('lifting' is the inverse operation of projecting). Lifting may not, however, be possible at points of singularity of the projection map, from the constraint manifold to the base space. A way of resolving these singularities, consistent with the interpretation that the constraint manifold is a degeneration of very fast or singularly perturbed dynamics is proposed. Dissert. Abstr.

N82-18503 Royal Aircraft Establishment, Farnborough (England).
A DESIGN FOR A 32-CHANNEL MULTIPLEXER
P. F. Martinson 26 Jan. 1981 35 p refs
(RAE-TM-RAD-NAV-145; BR77700) Copyright. Avail: Issuing Activity

A time scan analog system multiplexer used for recording data during flight trials of unmanned aircraft navigation sensors is described. The 32 inputs are buffered, then multiplexed in groups of 8 onto 4 lines. These four are multiplexed onto one line and the signal passes through the output buffer to the recorder. Aircraft attitude, heading and height are recorded. Signals from a camera and a kinetheodolite tracking system are synchronized. Operating conditions were simulated using a helicopter. Noise and drift are due to the recorder. The multiplexer copes well with signals of several kHz bandwidth (raw data) and signals of a few Hz bandwidth (processed data, test signals). It can be used with any multitrack tape recorder having an FM recording format on at least two tracks. It can be converted for use in a digital telemetry system. Author (ESA)

N82-18504 Defence Research Information Centre, Orpington (England).
NUMERICAL SIMULATION OF DIODE RECTIFIER BRIDGES: APPLICATION OF A NEW METHOD TO THE BRUSHLESS EXCITATION SYSTEM
L. Baes, M. S. Garrido, and F. Labrique Oct. 1981 14 p refs Transl. into ENGLISH from "Simulation numerique des ponts redresseurs a diodes application d'une methode originale au systeme d'excitation brushless", Can. Commun. and Power Conf., Montreal, 1976 p 269-272 Conf. held in Montreal, Quebec, 20-22 Oct. 1976
(DRIC-T-6478; BR80788) Copyright. Avail: Issuing Activity

A diode bridge rectifier simulation method is presented which unites the advantages of using a single system of nonlinear differential equations with the description of the source and load solely by their conditional variables. The bridge is compared to a network of nonlinear resistors whose values, always finite, are deduced from the values of the sole conditional variables of the source and the load. A simple numerical integration program suitable for analyzing sudden transients in which the source impedances play an important part is derived. It performs well when applied to the asynchronous operation of a brushless excitation alternator. Author (ESA)

N82-18505 Royal Aircraft Establishment, Farnborough (England). Radio and Navigation Dept.
A GENERAL PURPOSE INTERFACE BUS (GPIB)
A. M. Benson 19 Jun. 1981 25 p refs
(RAE-TM-RAD-NAV-168; BR79940) Copyright. Avail: Issuing Activity

The use of the Fairchild 96LS488 integrated circuit in the design of a GPIB interface for use with a desktop computer is illustrated. Circuits which convert GPIB data into parallel binary coded decimal data and provide facility for hardware interrupts are described. The interface transmits and receives data. Digital data are sent to a digital to analog converter. The analog output was amplified by a control unit and used to drive a rate table as part of a test facility for ring laser gyroscopes. A standard interface card is attached to the sending computer and the converter. The interface is easy to install and operates efficiently. Author (ESA)

N82-18506*# Westinghouse Electric Corp., Pittsburgh, Pa.
HIGH VOLTAGE POWER TRANSISTOR DEVELOPMENT Final Report, Nov. 1979 - Sep. 1981
P. L. Hower 30 Oct. 1981 54 p refs
(Contract NAS3-21949)
(NASA-CR-165547; Rept-81-9F5-HTRAN-R5) Avail: NTIS HC A04/MF A01 CSCL 09A

Design considerations, fabrication procedures, and methods of evaluation for high-voltage power-transistor development are discussed. Technique improvements such as controlling the electric field at the surface and preserving lifetimes in the collector region which have advanced the state of the art in high-voltage transistors are discussed. These improvements can be applied directly to the development of 1200 volt, 200 ampere transistors. M.D.K.

N82-18507*# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.
SECONDARY ELECTRON EMISSION FROM A CHARGED DIELECTRIC IN THE PRESENCE OF NORMAL AND OBLIQUE ELECTRIC FIELDS M.S. Thesis
Bahram Javidi Feb. 1982 110 p refs
(Grant NsG-3166)

(NASA-CR-168558) Avail: NTIS HC A06/MF A01 CSCL 09C

The secondary electron emission coefficient was obtained for a FEP-Teflon dielectric charged with monoenergetic electrons normally incident upon the surface of the specimen. Measurements of secondary emission coefficient were done for normal and oblique incidence with different primary beam energies in the presence of normal and oblique electric fields. A collimated probing beam was directed to different points on the surface of the specimen and the released or accumulated charge was monitored using an electrometer. The measured data for different probing beam energies, different impact points and different angles of incidence were plotted vs. impact energy and impact point. Data analyzed by computer simulations to find the potential distribution on the surface of the specimen and the electric field around it, is presented and discussed. M.D.K.

N82-18508*# Pennsylvania State Univ., University Park. Dept. of Electrical Engineering.

MAPPING OF ELECTRICAL POTENTIAL DISTRIBUTIONS WITH CHARGED PARTICLE BEAMS Final Report, Nov. 1977 - Feb. 1982

James W. Robinson Feb. 1982 61 p refs

(Grant NsG-3166)

(NASA-CR-168556) Avail: NTIS HC A04/MF A01 CSCL 09C

Methods for measuring electrostatic potentials on and near dielectric surfaces charged to several kilovolts are studied. Secondary emission from those charged dielectrics is measured. Candidates for potential measurement include the induced charge, from which potential is calculated; the trajectory endpoints of either high or low energy particles traversing the region near the surface; trajectory impact on the surface; and creating ions at points of interest near the surface. Some of the methods require computer simulations and iterative calculation if potential maps are to be generated. Several approaches are described and compared. A method using a half-cylinder as a test chamber and low-energy probing beams is adapted for the measurement of seconary emission. N.W.

N82-18509# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

AN ACTIVE FILTER FOR THE SIMULTANEOUS REALIZATION OF SEVERAL TRANSFER FUNCTIONS

Plinio Tissi Jan. 1982 10 p refs Submitted for publication

(INPE-2298-PRE/069) Avail: NTIS HC A02/MF A01

A low-pass filter which can realize a generic transfer function, after multipliers and one summer are included, is described. The resulting filter is canonical, since it utilizes a number of capacitors that equals the degree of the transfer function. T.M.

N82-18510# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SMALL SIGNAL DESIGN OF A DIELECTRIC RESONATOR STABILIZED OSCILLATOR

Paulo Mello Marshall and Carlos Eduardo Santana Dec. 1981 14 p refs Submitted for publication

(INPE-2285-PRE/061) Avail: NTIS HC A02/MF A01

The design of a dielectric resonator stabilized oscillator based on small signal scattering parameters is presented. A cylindrical dielectric resonator, magnetically coupled to a terminated microstrip line, is the principal element of the high Q tuning network connected to the input port of a feedback unstabilized transistor. Advantages of this configuration over the output band-stop resonator oscillator are the inhibition of the frequency tuning hysteresis phenomena and the larger tuning range. Accuracy of the design is verified by the performance of a 5430 MHz test oscillator. Tuning range, spectrum, and temperature characteristics are presented and discussed. Author

N82-18511# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

FM MODULATORS USING A PHASE LOCKED LOOP [MODULADORES DE FM USANDO PEASE-LOCKED-LOOP]

Wilton Jose Fleming Dec. 1981 62 p refs In PORTUGUESE; ENGLISH abstract

(INPE-2293-NTE/177) Avail: NTIS HC A04/MF A01

The use of the phase locked loop as a frequency synthesizer was studied as well as its possibilities as an FM modulator. The noise characteristics of the circuit were also investigated. A.R.H.

N82-18512# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

STABILIZED MICROWAVE OSCILLATOR FOR A DIELECTRIC RESONATOR [OSCILADOR DE MICROONDAS ESTABILIZADO POR UM RESSOADOR DIELECTRICO]

Paulo Mello Marshall and Carlos Eduardo Santana Jun. 1981 39 p refs IN PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981

(INPE-2123-RPE/347) Avail: NTIS HC A03/MF A01

The design and construction details of a microwave oscillator stabilized by a cylindrical dielectric resonator are presented. The resonator is coupled with the output port of a bipolar transistor and acts as a band-stop filter. The design is based on the experimental evaluation of the coupling between the resonator and a microstrip line, and on the scattering parameters specified for the bipolar transistor. At 3200 MHz the oscillator shows low FM noise and no spurious oscillations. The oscillating frequency has a 50 MHz mechanical tuning band and a temperature stability of about 9 ppm/C in the range 25-50 C. These characteristics together with the ease of mechanical constuction, fit this type of oscillator for application as a local oscillator in a great variety of microwave receivers. Author

N82-18513# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A 10 MHz 60 DEG PM DEMODULATOR [DEMODULADOR PM 60 DEG EM 10 MHZ]

Paulo Adabo Jul. 1981 16 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador-Bahia, Brazil, 8-15 Jul. 1981

(INPE-2157-RPE/376) Avail: NTIS HC A02/MF A01

A demodulator for digitally phase modulated signals is followed by an integrator that works as a phase detector. The circuit has a visual detector that indicates the presence or absence of the carrier. This circuit was tested and presented a good performance with the transmitter operating in the continuous mode. Author

N82-18514# Siemens A.G., Berlin (West Germany).

TEST SETUPS FOR THE DEVELOPMENT OF HIGH VOLTAGE CIRCUIT BREAKERS FOR HIGH SHORT CIRCUIT CAPACITIES Final Report, Aug. 1980

Rudolf Patzelt, Wolfgang Ruhnau, and Egon Zemann Bonn Bundesministerium fuer Forschung und Technologie Oct. 1981 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-81-194; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,90

A number of test setups and procedures are described for measuring and simulating the current and voltage conditions prevailing in short circuit breakers designed to interrupt short circuit currents from 80 to 100 kA. A synthetic test circuit was successfully developed, using the principles of both voltage and current injection. A capacitance current injection procedure allows for the establishment of the influence of iron in the magnetic circuit on the prospective transient recovery voltage of the breaker. Methods for measuring the post-arc current are indicated, and developed meshed grid and tube shunts are described. Synthetic test circuits are presented which are suitable for testing the capacitive switching capabilities of breakers. Author (ESA)

N82-18515# General Electric Co., Pittsfield, Mass. Electronic Systems Div.

ELECTRICAL CHARACTERIZATION AND SPECIFICATION OF SPECIAL PURPOSE LINEAR MICROCIRCUITS Final Technical Report, 24 Aug. 1978 - 1 Oct. 1980

John S. Kulpinski, Louis Carrozza, Theodore Simonsen, Donald VanAlstyne, Larry Deluca, John Dunn, Robert Mossman, Daniel Mui, Jamie Schwehr, and George Smith Griffiss AFB, N.Y. RADC Jun. 1981 494 p

(Contract F30602-78-C-0195; AF Proj. 2338)
(AD-A108247; RADC-TR-81-74) Avail: NTIS HC A21/MF A01 CSCL 09/5

This technical report is divided into chapters covering specific device types with electrical characterization, test methodology and results discussed. The following device types/families were characterized with the resulting slash sheets depicted: Adjustable Positive Voltage Regulators; Adjustable Negative Voltage Regulators; BiFet Operational Amplifiers; Multiple BiFet Operational Amplifiers; Voltage References; Programmable Voltage References; 12 Bit A/D Converters; 12 Bit D/A converters; and Sample/Hold Amplifiers. Samples of data sheets, histograms, and plots, are included in this report. GRA

N82-18516# Hughes Aircraft Co., Torrance, Calif.
RELIABILITY INVESTIGATION OF LOW NOISE GaAs FETs Final Technical Report, 31 Aug. 1978 - 31 Aug. 1980
Lawrence S. Bowman and W. Tarn Griffiss AFB, N.Y. RADC Jul. 1981 67 p refs
(Contract F30602-78-C-0295; AF Proj. 2338)
(AD-A108396; HAC-W-43413; RADC-TR-81-181) Avail: NTIS HC A04/MF A01 CSCL 09/1

The objective of the program was to assess the reliability and operating life characteristics of low noise, small signal, microwave, n-channel, gallium arsenide (GaAs), metal epitaxial semiconductor field effect transistors (MESFETs) with a Schottky-barrier gate, and to identify associated failure mechanisms with notice to the supplier that the devices would be used in a testing program sponsored by the Department of Defense and that results would be reported to the Government. The FETs obtained represented a broad cross section of currently available devices, and included both gold-based and aluminum gate metallizations with gate lengths nominally from 0.5 microns to 1.2 microns. GRA

N82-18517# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Avionics Lab.
MEASURED PULSE TRANSFER CHARACTERISTICS OF HIGH IMPEDANCE MICROSTRIP LINES Final Report, Mar. 1979 - Mar. 1980
David G. McLaine Apr. 1981 58 p refs
(AF Proj. 6096)
(AD-A108266; AFWAL-TR-80-1160) Avail: NTIS HC A04/MF A01 CSCL 09/1

Theoretical and experimental results of the propagation and coupling characteristics of fast risetime (50-150 ps) digital pulses on high impedance (100 ohm) microstrip lines are presented. Theoretical microstrip design equations are discussed and the significance of dispersion analyzed. Five mil lines on 35 mil alumina substrates were fabricated using standard thick film technology. Various line lengths, coupled line lengths, and coupled line spacings were analyzed to determine pulse degradation effects and the coupling coefficients between lines. Author (GRA)

N82-18518# Federal Aviation Administration, Washington, D.C.
ELECTRONIC EQUIPMENT, GENERAL REQUIREMENTS
22 Jun. 1981 63 p Supersedes FAA-G-2100/1b, FAA-G-2100/2a, FAA-G-2100/3a, FAA-G-2100/4b and FAA-G-2100/5a
(AD-A108388; FAA-G-2100C; FAA-G-2100/1b; FAA-G-2100/2a; FAA-G-2100/3a; FAA-G-2100/4b; FAA-G-2100/5a) Avail: NTIS HC A04/MF A01 CSCL 09/3

This specification covers the general requirements for the design and construction of ground electronic equipment. This specification establishes the ambient conditions within which equipment must operate satisfactorily and reliably; the general material, the process for selection and application of parts, and the tests for ground electronic equipment. Requirements applicable to individual equipments shall be as specified in the individual equipment specifications. Author (GRA)

N82-18519# State Univ. of New York at Albany. Dept. of Chemistry.
CHRONOAMPEROMETRIC TRANSIENTS AT THE STATIONARY DISK MICROELECTRODE
Tadeusz Hepel and Janet Osteryoung 30 Nov. 1981 37 p refs Submitted for publication
(Contract N00014-79-C-0682; NR Proj. 056-715)
(AD-A108567; TR-7) Avail: NTIS HC A03/MF A01 CSCL 09/1

Chronoamperometric transients for diffusion controlled reactions at stationary platinum and gold microelectrodes have been examined. The results are compared with those predicted theoretically for hemispherical electrodes and for disk electrodes. The hemispherical model was found to describe the current-time transients only qualitatively, while excellent agreement was obtained between the theory for a stationary disk and data for the hexacyanoferrate (II)/(III) redox reaction. Equations for mass transport to a stationary disk electrode derived earlier form the basis for graphical methods of analysis of a single current-time transient which permit the simultaneous determination of two of the three parameters electrode radius, diffusion coefficient, and concentration. A plot of I vs 1/sq. rt. t has the advantage of simplicity. A logarithmetic analysis (log I-log t) requires data over a greater time range but offers advantages in characterizing electrode geometry. The effects of surface irregularities and electrode sphericity are also discussed. Author (GRA)

N82-18520# Virginia Univ., Charlottesville. Dept. of Physics.
SUPERCONDUCTING ELECTRONICS Final Technical Report, 1 Jul. - 31 Dec. 1980
Bascom S. Deaver, Jr. and Robert J. Mattauch 1981 20 p refs
(Contract N00014-77-C-0440)
(AD-A108402) Avail: NTIS HC A02/MF A01 CSCL 20/3

The objectives of the research have been (1) to design, fabricate, and test Josephson mixers for use at frequencies greater than 100 GHz, (2) to fabricate and characterize various types of microbridges, particularly ones on semiconductor substrates which may exhibit measurable interaction with the substrate and (3) to measure the microwave properties of some NbN SQUIDs. Progress made on all of these topics is summarized and references to publications reporting the results in more detail are presented. GRA

N82-18521# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESTRUCTURABLE VLSI PROGRAM Semiannual Technical Summary, 1 Apr. 1980 - 31 Mar. 1981
Peter E. Blankenship 31 Mar. 1981 61 p refs
(Contract F19628-80-C-0002; ARPA Order 3797)
(AD-A108276; ESD-TR-81-153) Avail: NTIS HC A04/MF A01 CSCL 09/5

The main objective of the Lincoln Restructurable Very Large Scale Integration (RVLSI) Program is to develop methodologies for designing whole-wafer-scale systems with complexities approaching a million gates. In our approach, we envisage a modular style of architecture comprising an array of cells embedded in a regular interconnection matrix. Ideally, the cells should consist of only a few basic types. The interconnect matrix is a fixed pattern of metal lines augmented by a complement of programmable switches or links. Conceptually, the links could be either volatile or nonvolatile. They could be of an electronic nature such as a transistor switch, or could be permanently programmed through some mechanism such as a laser. The present main thrust of the current RVLSI Program is toward laser-formed interconnect. The link concept offers the potential for a highly flexible, restructurable type of interconnect technology which could be exploited in a variety of ways. For example, logical cells or subsystems found to be faulty at wafer probe time could be permanently excised from the rest of the wafer. The flexible interconnect could also be used to 'jump around' faulty logic and tie in redundant cells judiciously scattered around the wafer for this purpose. Also, the interconnect could be tailored to a specific application in order to minimize electrical degradations and performance penalties caused by unused wiring. GRA

N82-18522# Michigan Univ., Ann Arbor. Electron Physics Lab.
SIMULATION OF PULSED IMPATT OSCILLATORS AND INJECTION-LOCKED AMPLIFIERS Interim Report, Jun. 1980 - Feb. 1981
R. K. Mains, G. I. Haddah, and D. F. Peterson Wright-Patterson AFB, Ohio AFWAL Oct. 1981 45 p refs
(Contract F33615-77-C-1132; AF Proj. 2002)
(AD-A108483; TR-151; AFWAL-TR-81-1177) Avail: NTIS HC A03/MF A01 CSCL 09/5

A method for simulating the dynamic behavior of pulsed IMPATT oscillators using a quasi-static approximation is presented. The method used to characterize the IMPATT diode is explained. A particular circuit model is used which models the cylindrical cavity power combining circuit. The overall device-circuit interaction technique is outlined. Simulation results for a high-low, single-drift X-band GaAs IMPATT are presented. The method presented here can be employed for any type of IMPATT device. The pulsed oscillator properties of double-drift IMPATT diode structures are presently being investigated. Author (GRA)

N82-18523# Naval Research Lab., Washington, D. C. UV Measurements Branch.

A MICROCIRCUIT FOR SPACE APPLICATIONS Interim Report

S. R. Highley 4 Dec. 1981 9 p
(RR0330243)
(AD-A108286; NRL-MR-4672) Avail: NTIS HC A02/MF A01 CSCL 09/5

The need to reduce the volume of an electronic circuit package led to the development of a unique hybrid circuit package. Several problems were encountered during design, construction, and testing; and solved, producing a functional design with the final system package size about 1/5 that required for standard packaging. GRA

N82-18524# Pennsylvania State Univ., University Park. Applied Research Lab.

STRUCTURE OF A MULTIBEAM ADAPTIVE SPACE-TIME PROCESSOR

L. H. Sibul and Guy R. L. Sohie 30 Jul. 1981 19 p refs
(Contract N00024-79-C-6043)
(AD-A108352; ARL/PSU/TM-81-156) Avail: NTIS HC A02/MF A01 CSCL 09/3

It is shown that an adaptive multi-input, multi-output space-time processor (beamformer and filter) consists of a multi-input, multi-output adaptive processor and a nonadaptive beamsteering operator. The adaptive processor is determined by the spatial and temporal properties of the noise field; whereas, the beamsteering operator is determined a priori by the desired beamsteering directions. In this structure, the multichannel adaptive processor is common to all the desired beamsteering directions. Author (GRA)

N82-18525# Polytechnic Inst. of New York, Brooklyn. Microwave Research Inst.

BASIC RESEARCH IN ELECTRONICS (JSEP) Annual Report, 1 Apr. 1980 - 31 Mar. 1981

Arthur A. Oliner 30 Sep. 1981 120 p refs
(Contract F49620-80-C-0077; AF Proj. 2305)
(AD-A108502; POLY-MRI-1415-81; AFOSR-81-0775TR) Avail: NTIS HC A06/MF A01 CSCL 09/5

This annual report presents a summary of the scientific progress and accomplishments on research projects funded by the Joint Services Electronics Program (JSEP) for the contract period from 1 April 1980 through 31 March 1981. It does not contain information regarding accomplishments on research projects funded in other ways. The Joint Services Electronics Program at the Polytechnic is the core of interdisciplinary research in electronics encompassing programs in the Departments of Electrical Engineering, Physics and Chemistry under the aegis of the Microwave Research Institute. The research encompassed by this program is grouped under three broad categories: Electromagnetics, Solid State and Information Electronics. The detailed projects (work units) comprising the complete program are listed in the Table of Contents. In addition to the progress, we include for each of the work units the publications during the past year resulting from the research, and some of the recent interactions with the DOD or industry or other academic institutions. At the front of this Annual Report we present our Report on Significant Scientific Accomplishments, and at the end we append a comprehensive list of all the journal publications and conference proceedings during the period from August 1, 1980 to the present, arranged alphabetically according to the name of the first author. Author (GRA)

N82-18526# California Univ., Berkeley. Electronics Research Lab.

JOINT SERVICES ELECTRONICS PROGRAM Annual Progress Report, 1 Sep. 1980 - 31 Aug. 1981

D. J. Angelakos 30 Sep. 1981 144 p refs
(Contract F49620-79-C-0178)
(AD-A108347; UCB/ERL-81/1; AFOSR-81-0850TR) Avail: NTIS HC A07/MF A01 CSCL 09/5

An annual report of the JSEP (Joint Services Electronics Program) in Electromagnetics, Solid State Electronics, Materials and Devices, Quantum Electronics and Information Sciences is presented. Partial contents include: Electromagnetic Scattering by Multiple Targets and Targets in Multiple Media; Hot-Electron Injection and Trapping at Si/Insulator Interfaces; Molecular Beam Epitaxy and Its Applications to Studies of Materials Aspects of Microstructure Engineering; Study of Effects Limiting Realization of Far-Submicron Superconductive Electronic Structures; Research on Electronic Systems Composed of Polymer Films and Planar Si Devices for Transducer Applications; Millimeter and Infrared Heterodyne Mixing and Detection, and Computer Optimization of Electronic Circuits. GRA

N82-18527# Atomic Energy Research Establishment, Harwell (England). Instrumentation and Applied Physics Div.

OPERATING EXPERIENCE WITH THE HARWELL THERMO-MECHANICAL GENERATORS

E. H. Cooke-Yarborough Jun. 1980 14 p refs
(AERE-R-9829) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries also available from HMSO, £2

The Stirling-cycle thermomechanical generator (TMG) provides small amounts of electrical power continuously over long periods, while requiring much less fuel than other power sources running from hydrocarbon fuel or radioisotopes. Two of these 25 watt generators, fuelled by propane, have been used to power the UK National Buoy on two successive missions. A total of more than three years experience at sea has now been accumulated. In addition, a 60 watt version has provided the power for a major lighthouse for more than a year. An early development version of the Thermo-mechanical Generator, adapted to run from the heat of a radioisotope source, was loaded with strontium 90 titanate in October 1974 and has run continuously in the laboratory ever since. The improvements and changes found necessary in the course of 90,000 generator-hours of running time are described, and the improvements in operational performance and reliability which have resulted are outlined. DOE

N82-18528# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Uebertragungstechnik und Elektroakustik.

A DESCRIPTIVE LANGUAGE FOR THIN FILM CONDUCTORS [CBDL/1: EINE BESCHREIBUNGSSPRACHE FUER FLACHLEITERPLATTEN]

Gerhard Rueckle Feb. 1981 40 p refs In GERMAN
(IND-FB-107) Avail: NTIS HC A03/MF A01

The proposed programming language CBDL/1, which simplifies the computerized design of printed circuit boards is examined. In the development of CBDL/1 the requirements for highest comfort and greater failure safety for the operator and easier calculation implementation for the CAD-developer are considered. Transl. by E.A.K.

N82-18529# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.

HIGH CONCENTRATION IN GaAs PHOTOVOLTAIC SYSTEMS [L'ALTA CONCENTRAZIONE NEI SISTEMI FOTOVOLTAICI AL GaAs]

G. Guarini 1981 12 p refs In ITALIAN Presented at Giornate di Studio su Conversione Fotovoltaica dell'Energia Solare, Milan, 4-5 Jun. 1981
(CISE-1713) Avail: NTIS HC A02/MF A01

The feasibility of a spectral separation method for increasing the efficiency of photovoltaic cells is considered. The technical state of the art of GaAs cells is reviewed. The structure of a 100 Wp high concentration system, comprised of a matrix of Fresnel lenses with as many spectral filters and pairs of cells is described. Operating results are analyzed. Transl. by J.D.H.

N82-18530# Thomson-CSF, Saint Egreve (France). Div. Tubes Electroniques.

TESTS CONCERNING TECHNOLOGICAL PROBLEMS WITH

CHARGE TRANSFER ELECTRON MULTIPLIERS Final Report [ESSAIS CONCERNANT LES PROBLEMES TECHNOLOGIQUES LIES AUX DISPOSITIFS INTENSIFICATEURS A TRANSFERT DE CHARGE]
M. Blamoutier and S. Veron Paris ESA 24 Nov. 1980 29 p refs In FRENCH
(Contract ESTEC-2865/76/NL-AK)
(TDI/1.1851/80; Rept-2388-I; ESA-CR(P)-1464) Avail: NTIS HC A03/MF A01

Diverse design problems of an electron multiplier tube with video output were analyzed. A structure where a charge transfer matrix under bombardment replaces the output screen was considered. The matrices THX 1115 and 1130 were developed. Thin structure fabrication techniques were explored. Tube and matrix support mock-ups were built and tested. The mechanical strength of the structure remains problematic. The matrix is shown compatible with its environment. However an operational engineering model was not obtained, preventing determination of performance characteristics. Author (ESA)

N82-18531# Elettronica S.R.L., Rome (Italy). Optoelectronics Div.
EVALUATION OF LINEAR ARRAYS OF INFRARED DETECTORS FOR THE 1.5 TO 5 MICRON RANGE
C. Corsi, G. Marangoni, S. deVito, and C. Damato Paris ESA Sep. 1980 79 p
(Contract ESTEC-3979/79/NL-PP(SC))
(RT-80/198; ESA-CR(P)-1473) Avail: NTIS HC A05/MF A01

Linear and two-dimensional IR arrays based on ion beam technology and compatible with integrated circuit (IC) technology were tested. Outstanding optoelectronic characteristics are achieved. These characteristics permit analog/digital conversion to the first level of the reading subunit, overcoming the problem of ultralow noise preamplifiers connected to each individual sensing element. Further improvements include capability of manufacturing IR detector arrays with no blind element and no dark space, and compatibility with silicon IC technology and multilayer structure capability. Research shows arrays to be suitable for pushbroom satellite application. Author (ESA)

N82-18532# Messwandler-Bau G.m.b.H., Bamberg (West Germany).
SF6 PLASTIC FILM INSULATED OUTDOOR BUSHING FOR METALCLAD SWITCHGEAR OPERATING AT SYSTEM VOLTAGES OF 420 kV AND ABOVE Final Report
Hermann Dietz Bonn Bundesministerium fuer Forschung und Technologie Oct. 1981 64 p refs In GERMAN and ENGLISH
(Contract BMFT-ET-4081-A)
(BMFT-FB-T-81-172; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13.50

In replacement of conventional oil-paper bushings, a type of SF6 insulated bushing with polypropylene plastic film dielectricum was developed for outdoor operation of metalclad switchgear. Such bushings have the advantage of the conformity of the insulation with that of the matching switchgear and of the nonflammability of the SF6 gas. The choice of the plastic film, the winding technique, the thermal and dielectrical test program, and the high voltage long-term test program are described. Series production of a 420 kV bushing is under way and research specimens for 525 kV were successfully tested. Author (ESA)

N82-18533# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
MIXING WITH A SQUID AT MILLIMETER WAVES
Pekka Somervuo 1979 15 p refs
(Rept-S-117; ISBN-951-752-075-1) Avail: NTIS HC A02/MF A01

The construction of a millimeter wave mixer using a SQUID type point contact Josephson junction is described and a simplified analysis of the mixing is given. Experimental results showed that at 33 GHz the measured conversion loss with external pumping was 8 dB using an intermediate frequency (IF) of 900 MHz. With fourth harmonic pumping a conversion gain of 10 dB was achieved at 35 GHz. In all experiments strong noise levels were measured at IF. In order to improve noise properties a mixer construction based on magnetometer principles is proposed. Author (ESA)

N82-18534*# Arizona Univ., Tucson.
THE CONFERENCE ON HIGH TEMPERATURE ELECTRONICS
D. J. Hamilton (LASL), J. B. McCormick, W. J. Kerwin, and J. A. Narud 1981 134 p refs Conf. presented at Tucson, Ariz., 25-27 Mar. 1981; sponsored by NASA, IEEE Industrial Electronics and Control Instrumentation Council, IEEE Solid State Circuits Council, DOE, Nuclear Regulatory Commission, NSF and LASL
(NASA-CR-168505; PB82-114414; NSF/ECS-81007; IEEE-81CH1658-4) Avail: NTIS HC A07/MF A01 CSCL 09C

The status of and directions for high temperature electronics research and development were evaluated. Major objectives were to (1) identify common user needs; (2) put into perspective the directions for future work; and (3) address the problem of bringing to practical fruition the results of these efforts. More than half of the presentations dealt with materials and devices, rather than circuits and systems. Conference session titles and an example of a paper presented in each session are (1) User requirements: High temperature electronics applications in space explorations; (2) Devices: Passive components for high temperature operation; (3) Circuits and systems: Process characteristics and design methods for a 300 degree QUAD or AMP; and (4) Packaging: Presently available energy supply for high temperature environment. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-18535 Minnesota Univ., Minneapolis.
COAGULATION AND DEPOSITION OF ULTRAFINE AEROSOLS IN TURBULENT PIPE FLOW Ph.D. Thesis
John Erwin Brockmann 1981 246 p
Avail: Univ. Microfilms Order No. 8125936

The simultaneous coagulation and diffusion of ultrafine particles (diameter < 0.02 micrometer) in turbulent pipe flow was studied with emphasis on the aerosol measuring instruments used. Calibration data for the TSI continuous flow condensation nucleus counter are given. A diffusion battery constructed of layers of metal screens is described as well as a sample extraction and dilution system (SEDS) designed to sample a high concentration of ultrafine particles with low characterized particle losses and minimal change in the size distribution due to coagulation. A simplified model for simultaneous Brownian coagulation and diffusional deposition of a free molecule aerosol in turbulent tube flow is presented. The model specifically addresses the case where the effects of both coagulation and deposition are important and the simplifying assumption of pure coagulation or pure deposition cannot be made. Dissert. Abstr.

N82-18536 Colorado State Univ., Fort Collins.
A TIME DEPENDENT FLOW MODEL FOR THE INNER REGION OF A TURBULENT BOUNDARY LAYER Ph.D. Thesis
Ho-Chen Chien 1981 154 p
Avail: Univ. Microfilms Order No. 8126422

Response of the flow variables to external driving forces is nonlinear for shear flows. For the turbulent boundary layer case, surface shear stress fluctuation of magnitude as great as the mean value are observed. A model which incorporates a discrete time dependent solution for the inner region of the turbulent boundary layer is proposed. The model requires stochastic averaging of the time dependent solution to account for the random aspect of the flow. The physical model for the flow near the surface is based on the bursting cycle observed in the inner region of a turbulent boundary layer. Localized pressure gradients created in the valleys of the large scale structures of

the outer region of the flow are assumed to be the origin of the bursting process. This model treats the sweep motion as an impulsively started flow over a flat plate. An averaging technique is demonstrated to predict the important features of the surface shear stress. Dissert. Abstr.

N82-18537 California Univ., Berkeley.
INSTRUMENTATION FOR IMAGING OF FLUID FLOW USING NUCLEAR MAGNETIC RESONANCE WITH AN EXAMPLE OF ONE-DIMENSIONAL FLOW IMAGING Ph.D. Thesis
Joel Libove 1981 145 p
Avail: Univ. Microfilms Order No. 8200185

A new method for producing one-dimensional images (projections) showing average flow velocities of fluids in pipes, using Nuclear Magnetic Resonance (NMR) is presented. Images of this type have potential applications in hydrodynamic studies of flow structures, and in studies of blood flow in the human body. The spin echo signals measure fluid velocity and obtain the spatial flow distribution. In the technique, different regions of the sample are irradiated in rapid succession. The result is a 'multiple echo' signal whose magnitude, over time, is the spatial profile of proton density, and whose phase at a given time indicates the average flow velocity at a given position. Special NMR apparatus which was designed and constructed for testing this technique is discussed in detail. Also, a theoretical analysis of the technique is presented, followed by experimental results showing a flow profile for a known arrangement of tubes of flowing water. Dissert. Abstr.

N82-18538 Minnesota Univ., Minneapolis.
THERMAL HYDRAULIC STABILITY OF FLOW IN PARALLEL CHANNELS Ph.D. Thesis
Hossein Pournourbakhsh 1981 225 p
Avail: Univ. Microfilms Order No. 8125997

The thermal hydraulic stability of flow in parallel channels is investigated. A numerical (finite difference) calculational program for analyzing both steady state and transient steam water flows in a heated channel with a prescribed axial heat flux is presented. The model is based on a one dimensional drift velocity formulation of the two phase flow conservation equations, including the effects of radial distribution of void and thermal nonequilibrium between the vapor and liquid phases. Attention is given to flow regimes so as to more properly define the use of available correlations for the constitutive equations. The analysis is extended to superheat regions. Heat effects due to tube walls are included in the analysis. Steady state as well as stability predictions are compared to available experimental results. Dissert. Abstr.

N82-18539 Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
SOME RECENT DEVELOPMENTS IN AERONAUTICAL FLUID MECHANICS
E. G. Broadbent 6 Mar. 1981 36 p refs Presented at 23rd British Theoret. Mech. Colloq., Bradford, England, 6-9 Apr. 1981
(RAE-TM-Aero-1894; BR78251) Copyright. Avail: Issuing Activity

The state of the art in the calculation of the inviscid flow field of a wing at transonic speeds, the calculation of the viscous boundary layer (including the wake, interaction with shocks, and the treatment of high lift devices) and the application of vortex flows to the adoption of strakes was reviewed. The inclusion of shock coefficients and coordinate transformations increase transonic field calculation accuracy for inviscid flow, but shock equations remain extremely time consuming. Advances in boundary layer calculation include second order methods which allow for wall curvature, second order Reynolds stresses, and a pressure gradient normal to the wall. Navier-Stokes equation solving by time marching is successful for simple geometries. Analysis methods which include leading edge vortices are required in order to understand strake effects. Author (ESA)

N82-18540*# Old Dominion Univ., Norfolk, Va. Dept. of Mathematical Sciences.
BURGERS APPROXIMATION FOR TWO-DIMENSIONAL FLOW PAST AN ELLIPSE Progress Report, 26 May - 26 Nov. 1981
J. Mark Dorrepaal Feb. 1982 27 p refs
(Grant NAG1-197)
(NASA-CR-168552) Avail: NTIS HC A03/MF A01 CSCL 20D

A motivation is given for studying Burgers flow and a solution technique is outlined which works equally well for Oseen or Burgers flow past a circular cylinder. The separation behind the cylinder, the drag experienced by the cylinder, and asymptotic behavior far from the cylinder are described. It is shown that the predictions of Burgers flow near the cylinder provide a substantial improvement over those of Oseen flow. Finally, the equations of motion for Burgers flow past an ellipse are formulated and solved. A.R.H.

N82-18541# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THERMAL RESISTANCE OF CONVECTIVELY COOLED PLATES WITH APPLIED HEAT FLUX AND INTERNAL HEAT GENERATION
Nellore Srinivasan Venkataraman, Humberto Pontes Cardoso, and Olavo Bueno deOliveiraFilho Dec. 1981 24 p refs Submitted for publication
(INPE-2291-PRE/066) Avail: NTIS HC A02/MF A01

The conductive heat transfer in a rectangular plate with internal heat generation, with one end convectively cooled and a part of the opposite end subjected to external heat flux, is considered. The remaining part of this end as well as the other two sides are thermally insulated. Both uniform and nonuniform internal heat generation are considered. For the case of uniform heat generation an analytical solution has been found, and for the nonuniform case a finite difference numerical solution is presented. The variation of the thermal resistance with Biot modulus, the plate geometry, the internal heat generation parameter and the type of profile of internal heat generation is discussed. Author

N82-18542# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THERMAL RESISTANCE OF A CONVECTION COOLED FLAT PLATE WITH A NONUNIFORM APPLIED HEAT FLUX AND INTERNAL GENERATION OF CONSTANT HEAT [RESISTENCIA TERMICA DE UMA PLACA PLANA RESFRIADA POR CONVECCAO COM FLUXO DE CALOR APLICADO NAO-UNIFORME E GERACAO INTERNA DE CALOR CONSTANTE]
Nellore Srinivasan Venkataraman, Olavo Bueno DeOliveira Filho, and Humberto Pontes Cardoso Jun. 1981 27 p refs In PORTUGUESE ; ENGLISH summary Presented at the 33rd Ann. Meeting of SPBC, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2131-RPE/355) Avail: NTIS HC A03/MF A01

The two dimensional conductive heat transfer in a rectangular plate with constant internal heat generation and with two opposite sides insulated, the third subjected to convective cooling by a fluid at a constant temperature and a portion of the remaining end subjected to an arbitrary heat flux distribution is analyzed. This type of problem has applications in the design of solar collector plates, the mounting plates of electronic banks, in some heat exchangers, and in thermal control of satellites. It is observed that the nondimensional thermal resistance can be expressed as a function of the nondimensional plate thickness and contact width, the Biot number, and the ratio of the total internal heat generation to the total heat flux. As was expected, if the thermal resistance resulting from one-dimensional heat conduction is subtracted from the total thermal resistance, the resulting value will still be dependant on the internal heat generation. J.M.S.

N82-18543# Science Applications, Inc., McLean, Va.
SPECTRAL MODEL PREDICTIONS OF MEAN-SQUARE-SHEAR DISTORTION RATES Technical Report, 20 Nov. 1980 - 7 May 1981
Walt Grabowski and Fred C. Newman 7 May 1981 23 p refs
(Contracts N00014-81-C-0084; N00014-81-C-0075)
(AD-A108211; SAI-82-485-WA) Avail: NTIS HC A02/MF A01 CSCL 20/4

It is possible to use a simple shear spectral model to produce some estimates of the mean-square velocity difference over given

values of delta z. The distortion of a fluid region (a wake cross section, say) of dimension L is clearly due to velocity differences over delta z equal to L and smaller. The behavior of velocity differences over delta z with a simple model for the shear spectral density function is explored. Author (GRA)

N82-18544# SRI International Corp., Arlington, Va.
DRAG REDUCTION AND ADAPTIVE BOUNDARY CONDITIONS
C. Callan and K. Case Nov. 1981 63 p refs
(Contract MDA903-78-C-0086; ARPA Order 2504)
(AD-A108609; SRI-JSR-81-17) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report considers the problem of increasing the maximum speed at which the boundary layer of a body in water can remain in laminar flow. It is shown that substantial improvement can be made by modifying the boundary conditions of the linear stability problem. The concern of affecting the turbulence itself to reduce drag is not addressed. Author (GRA)

N82-18545# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
PREDICTION OF LAMINAR-TO-TURBULENT BOUNDARY LAYER TRANSITION IN AXIAL-FLOW TURBOMACHINERY Interim Report, 1 Oct. 1980 - 30 Sep. 1981
Charles E. Kluck Sep. 1981 73 p refs
(Grant AF-AFOSR-0004-81; AF Proj. 2307)
(AD-A108642; ISU-ERI-AMES-82030; TCRL-21; AFOSR-81-0806TR) Avail: NTIS HC A04/MF A01 CSCL 13/11

Current analytical studies regarding the laminar-to-turbulent boundary layer transition process, including relevant analysis of laminar separation, and analytical and experimental studies concerning parametric effects on transition pertinent to axial-flow turbomachine blade rows are reviewed. These include the effects of pressure gradient, freestream turbulence, surface roughness, heat transfer, and combined effects. Finally, the work of various authors who established data correlations for transition on axial-flow turbomachine blade rows is evaluated. Predictive equations and charts were presented as a reference guide for determining the transition region on blades. Additionally, equations for calculating transitional boundary layer growth are presented. Author (GRA)

N82-18546# Rhode Island Univ., Kingston.
STABILITY ANALYSIS OF THE COMPRESSIBLE, ADIABATIC, SIMILAR BOUNDARY LAYER EQUATIONS (LOWER BRANCH) Final Report, 1 May 1980 - 30 Apr. 1981
G. R. Verma, W. I. Hankey, and S. J. Scherr May 1981 53 p refs
(Grant AF-AFOSR-0150-80; AF Proj. 2307)
(AD-A108507; AFOSR-81-0782TR) Avail: NTIS HC A04/MF A01 CSCL 20/4

In a previous report, the authors analyzed the stability of the lower branch solutions of the incompressible (M sub infinity = 0) Falkner-Skan boundary layers. This report extends this work by including the effect of Mach number M sub infinity on the stability of adiabatic case. Author (GRA)

N82-18547# Tel-Aviv Univ. (Israel). Dept. of Fluid Mechanics and Heat Transfer.
ON THE RELATIONSHIP BETWEEN TRANSITIONAL AND FULLY TURBULENT SHEAR FLOW Annual Report, 1 Mar. 1980 - 31 Mar. 1981
I. Wygnanski 31 May 1981 169 p refs
(Grant AF-AFOSR-3275-77; AF Proj. 2307)
(AD-A108367; AFOSR-81-0764TR) Avail: NTIS HC A08/MF A01 CSCL 20/4

Pulsating flow of air in a straight smooth pipe was investigated experimentally. The period of forcing ranged from 0.5 sec to 5 sec which resulted in the change in the non-dimensional frequency parameter alpha = r sq root of w/nu of 4.5 to 15. The introduction of periodic surging had no effect on the time mean quantities. The present data was compared in detail with the theory of Uchida (1956) in the laminar flow regime. The time dependent components at the forcing frequency were presented by the radial distribution of amplitude and phase. An integral momentum equation in a time dependent flow requires a force triangle to be maintained at any instant. The triad of forces are: pressure, inertia and shear. All terms of the force balance equation were measured independently providing a good check of data. The measured turbulent characteristics of the flow, including the RMS values of the velocity fluctuations, Reynolds stress and short-time power spectra are dependent on the phase of the forced oscillations. The radial distribution of the phase angle of velocity is qualitatively different in laminar and turbulent flows. In order to explain this difference the concept of a relaxation time of the turbulent flow was employed. Transitional flow in a boundary layer is also briefly discussed. Author (GRA)

N82-18548# Colorado Univ. at Boulder. Dept. of Mechanical Engineering.
ANALYTICAL PREDICTION OF TURBULENT HEAT TRANSFER PARAMETERS Annual Report, 1 Oct. 1980 - 30 Sep. 1981
Adrian Bejan Dec. 1981 60 p refs
(Contract N00014-79-C-0006; NR Proj. 097-431; RR0240302)
(AD-A109024; CUMER-81-3; AR-1) Avail: NTIS HC A04/MF A01 CSCL 20/4

The objective of this research effort is to construct a purely theoretical foundation for the phenomenon of turbulent heat transfer. In this first annual report, the current methodology of theoretical research is reexamined critically. The report outlines in three self-standing units (papers) the new theoretical viewpoint that turbulence is the result of inviscid flow buckling. This viewpoint leads to first examples of theoretical prediction of turbulence parameters, for instance, the transition to turbulence, the flapping motion of turbulent jets, the frequency of vortex shedding and the meandering and mixing mechanism of thermal plumes. Author (GRA)

N82-18549# Imperial Coll. of Science and Technology, London (England). Centre for Computational Fluid Mechanics, Heat Transfer and Combustion.
A GENERAL COMPUTER PROGRAM FOR FLUID-FLOW, HEAT-TRANSFER AND CHEMICAL-REACTION PROCESSES
D. B. Spalding Sep. 1980 37 p refs Presented at Intern. FEM-Congr., Baden-Baden, West Germany, 17-18 Nov. 1980 (HTS/81/10) Avail: NTIS HC A03/MF A01

A code for parabolic, hyperbolic, or elliptical numerical integration is described. It consists of a series of closely linked computer codes and can be used to solve steady state problems or to simulate a transient process, e.g., a pipe break in a nuclear power plant. Finite domain equations are formulated in a fully implicit manner so that steady state problems can be solved expeditiously. The size of the time step in transient problems was determined by the speed of the physical events simulated. One, two, or three dimensions can be handled. Author (ESA)

N82-18550# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
EXPERIMENTAL MODEL STUDIES OF A HYDRAULIC RAM WITH SPECIAL EMPHASIS ON THE VELOCITIES IN THE RAM TUBE [EXPERIMENTELLE UNTERSUCHUNGEN AN EINEM MODELL EINES HYDRAULISCHEN WIDDERS UNTER BESONDERER BERUECKSICHTIGUNG DER GESCHWINDIGKEITEN IM WIDDERROHR]
Martin Basfeld Dec. 1980 129 p refs In GERMAN
(MPIS-28/1980; ISSN-0436-1199) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23.55

The velocity of the ram tube to make it accessible for production in pattern flows examining human circulation was investigated. A simplified theory of the function of the hydraulic ram was developed using the Navier-Stokes equation for a square rubbing component for one dimensional flows. The influence of the valve movement on the ram efficiency is evaluated. The difference between the significance of the influences on the ram model as opposed to the technical ram is discussed. E.A.K.

N82-18551# European Space Agency, Paris (France).
AN INTEGRAL EQUATION FOR THE VELOCITY FIELD OF

IRROTATIONAL FLOWS AROUND BLUNT BODIES
Barbara Schmitt-vonSchubert Oct. 1981 28 p refs Transl. into ENGLISH from "Integralgleichung fuer das Geschwindigkeitsfeld drehungsfreier Stroemungen um stumpfe Koerper", Rept. DFVLR-FB-80-25 Goettingen, West Germany
(ESA-TT-702; DFVLR-FB-80-25) Avail: NTIS HC A01/MF A01; DFVLR, Cologne DM 7.30

An integral equation which characterizes the velocity of the stationary flow around blunt bodies is derived. The flow is assumed irrotational, i.e., only such discontinuity surfaces occur for which this assumption remains valid. The behavior of the integral equation at such a discontinuity surface is discussed. The solution of the equation is shown similar to the solution of a wall flow equation. Author (ESA)

N82-18552# Ferngas Nordbayern G.m.b.H., Bamberg (West Germany).
REPORT ON THE EXPERIENCES WITH THE GAS COMPRESSION HEAT PUMP SYSTEM OF THE SCHOOL AND SPORTS CENTER AT ALTENKUNSTADT Final Report, Dec. 1980
Fritz Tscherter Bonn Bundesministerium fuer Forschung und Technologie Oct. 1981 109 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-175; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 23,10

Three years of operation of a 1200 kw natural gas boiler system supplemented by a 800 kw gas heat pump system are evaluated and the savings in primary energy are assessed. Setup, control system and measuring instrumentation are described. The proximity of a river allows an hybrid operation whereby 100% of the heat is produced by the gas powdered heat pump for any river temperature above 3 C whereas below that temperature the gas boiler takes over completely. Annual heat pump heating figures between 1.66 and 1.72 were obtained, thus yielding a saving in primary energy between 36% and 47%, in good agreement with the design values. The cost analysis shows that the savings thus achieved cover the operating costs specific to the heat pump. Author (ESA)

N82-18553# Thermo Electron Corp., Waltham, Mass.
OPEN-CYCLE VAPOR COMPRESSION HEAT PUMP Annual Progress Report, 1980
Ravi Sakhuja and Frederick E. Becker 5 May 1981 54 p
(Contract GRI-5011-342-0094)
(PB82-110503; TE4224-243-81; GRI-80/0064) Avail: NTIS HC A04/MF A01 CSCL 13A

Recovery and upgrading of low-grade steam or waste heat sources offers a great potential of energy conservation. Thermo Electron is developing an open cycle vapor compression steam heat pump to meet this objective. The system utilizes excess low-pressure steam or that produced from an industrial excess heat source with a waste heat boiler and compresses this steam to the desired pressure level for process use. The compressor is driven by a prime mover such as a gas turbine, gas engine, etc. The prime mover exhaust heat also can be recovered to generate additional process steam. The fuel consumption of this system can be as low as 30 to 50 percent in comparison to a direct-fired boiler over the expected range of process conditions. Simple payback periods as low as one year can be achieved. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-18554 Illinois Univ. at Urbana-Champaign.
APPLICATIONS OF MULTI-PINHOLE GAMMA CAMERA COLLIMATION TO TOMOGRAPHY AND IMAGE ENHANCEMENT Ph.D. Thesis
David Ronald Simpson 1981 148 p
Avail: Univ. Microfilms Order No. 8127692

Multi-pinhole gamma camera collimation was introduced in the field of emission tomography. This collimation process simultaneously produces several images covering a limited angular range, which may then be recombined to obtain tomographic slices of the object imaged. A possible method for improving the images obtained by this technique by combining two multi-pinhole views taken 90 deg apart was investigated. Collimators were designed and built both for tomography and imaging tablet disintegration, and computer programs were written to reconstruct the images by simple backprojection and by filtered backprojection. The use of multi-pinhole collimators to image the disintegration of tablets in vivo was clearly demonstrated. Phantom tests done in vitro were capable of imaging defects as small as 5 sq mm, while images made with real tablets both in vitro and in vivo readily showed the onset and progress of the tablet disintegration. Dissert. Abstr.

N82-18555 Royal Aircraft Establishment, Farnborough (England).
THE EFFECT OF ATMOSPHERIC TURBULENCE ON AIR TO GROUND PHOTOGRAPHY
J. G. Ballantyne 18 May 1981 31 p refs
(RAE-TR-81065; RAE-IT-175; BR80525) Copyright. Avail: Issuing Activity

The theory of optical effects of atmospheric turbulence is summarized and the derivation of an equation relating the modulation transfer function of an optical path through the atmosphere to a weighted integral of the structure constant of refractive index along that path is outlined. Methods of estimating the structure constant from meteorological parameters are discussed and FORTRAN subroutines for evaluating the integral and estimating the modulation transfer function of the path under any required conditions are given. High aperture optical systems are considered preferable because they permit shorter exposures, thereby reducing or eliminating turbulent image movement.
Author (ESA)

N82-18556*# National Aeronautics and Space Administration, Washington, D. C.
SPECTRAL TRANSFORMATION IN THE SOFI COMPLEX FOR PROCESSING PHOTOGRAPHIC IMAGES ON THE ES COMPUTER, PART 1
A. S. Debabov and D. A. Usikov Jun. 1979 22 p refs Transl. into ENGLISH of Rept. Pr-394 Inst. of Space Research, Moscow, 1978 p 1-20 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75632-Pt-1; PR-394) Avail: NTIS HC A02/MF A01 CSCL 14E

A description is given of three programs catalogued in the form of object modules in the library of a system for processing photographic images computer. PFT is the subprogram of the multi-dimensional BPF of real-valued information, in the operative computer memory. INRECO is a subprogram-interface between the real and complex formats for representing two-dimensional spectra and images. FFT2 is a subprogram for calculating the correlation functions of the image using the previous subprograms. T.M.

N82-18557*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPATIAL ENERGY DISTRIBUTION Patent Application
Thomas J. Lash, inventor (to NASA) Filed 2 Oct. 1981 10 p
(NASA-Case-LAR-12631-1; US-Patent-Appl-SN-308008) Avail: NTIS HC A02/MF A01 CSCL 14B

A system is described in which an X-Y recorder (translator) is modified to automatically scan a detector in a plane perpendicular to the beam of a tunable diode laser to obtain a spatial energy distribut on of the beam. The recording pen of a second X-Y recorder is moved in synchronism with the detector and records the output of the detector. Consequently, a recording is made by the second recorder that represents the energy distribution of the beam in the plane scanned by the detector. A step signal is applied to the translator and recorder to move the detector and the recording pen in the Y-direction and is

also applied to the X-input of recorder to skew the recording to make it appear to be three-dimensional. NASA

N82-18558# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYSTEM FOR STABILIZATION AND POINTING OF A STRATOSPHERIC BALLOON-BORNE TELESCOPE [SISTEMA PARA ESTABILIZACAO E APONTAMENTO DE TELESCOPIO EMBARCADO EM BALAO AESTRATOSFERICO]
Paulo Donato Allemand Borges, Cesar Celeste Ghizoni, and Carlos de Oliveira Lino Jun. 1981 9 p refs In PORTUGUESE; ENGLISH abstract Presented at the 2nd Natl. Meeting on Automation, Salvador, Brazil, 8-15 de Jul. 1981
(INPE-2103-RPE/330) Avail: NTIS HC A02/MF A01

A control system for pointing and stabilization of an infrared radiometer to be flown in stratospheric balloon missions was developed and built. This system permitted the azimuth stabilization and orientation of the entire scientific platform, on which all missions subsystems were assembled, as well as the elevation of the longitudinal axis of the telescope alone. The classical control philosophy with linear and angular position and velocity sensors is used. The control reference was supplied by an on-board microcomputer, via telecommand. A flight in November 1980 produced a one degree accuracy in the elevation control loop and a quite acceptable stabilization in azimuth for the requirements of that mission. Author

N82-18559*# Aerojet Electrosystems Co., Azusa, Calif.
A 16 X 16 ELEMENT EXTRINSIC SILICON DETECTOR ARRAY
Dec. 1981 53 p refs
(Contract NAS2-10792)
(NASA-CR-166285; Rept-6152) Avail: NTIS HC A04/MF A01 CSCL 14B

Two bismuth-doped silicon accumulation-mode charge-injection device (AMCID) infrared detector arrays are studied. The geometry and composition of the arrays, and a description of the cold and warm electronics components of the system are described. Instructions for setting up and operating the array system, plus results of a functional test, are included. B.W.

N82-18560# Accumetrics Corp., Cambridge, Mass.
APPLIED RESEARCH AND DEVELOPMENT OF FALLING-SPHERE DENSITOMETERS PAYLOADS OF IMPROVED DESIGN Final Report, Jan. 1979 - Aug. 1981
Donald H. Fryklund Aug. 1981 66 p
(Contract F19628-79-C-0058; AF Proj. 6690)
(AD-A108316; AC-267; AFGL-TR-81-0233) Avail: NTIS HC A04/MF A01 CSCL 14/2

Four complete falling-sphere densitometer systems were designed and launched, with generally satisfactory results, at three locations: New Mexico, Sweden, and Alaska. The task included the provision and launch responsibility for the nose cones and ejection systems for all densitometers and the provision and launch responsibility for two unique support units for the payloads flown in Sweden. Refinements were made to improve system accuracy in the calibration and data reduction techniques for the Z-axis channels of the sphere. The Z-axis amplifiers were modified to improve their performance. A wide-band accelerometer was designed and integrated into the sphere system to provide for a high resolution instrument to enable small-scale wind and turbulence studies of the high-altitude atmosphere. The sphere was reintegrated to provide for a more powerful transponder and a PCM-ranging system. A study was made to reassess the sphere configuration to reduce its gross weight. Design changes will reduce this weight by 1 lb. Additional volume was recovered for future expansion in the sphere instrumentation. GRA

N82-18561# Delta Information Systems, Inc., Jenkintown, Pa.
ERROR PROCESSING TECHNIQUES FOR THE MODIFIED READ FACSIMILE CODE Final Report
Richard A. Schaphorst Washington National Communication System Sep. 1981 52 p refs
(Contract DCA100-80-C-0233)
(AD-A108608; NCS-TIB-81-9) Avail: NTIS HC A04/MF A01 CSCL 09/4

The purpose of this Technical Information Bulletin is to evaluate the relative effectiveness of four different 'error processing techniques' for the Modified READ code. The four different techniques which are investigated are listed below in order of increasing complexity of implementation: Print White (PW); Print Previous Line (PPL); Print Previous Line/White (PLW); and Normal Decode/Previous Line (NDPL). The analysis is performed by means of computer simulation. A total of 72 computer runs were performed at different combinations of CCITT test document, vertical resolution, K-factor and source of transmission errors. The performance of four candidate techniques is measured by both objective and subjective procedures. The quantitative analysis is accomplished using the Error Sensitivity Factor (ESF) which represents the average number of incorrect pels in the output document caused by a transmission error. The subjective analysis is based upon viewing actual error-contaminated images generated in the simulation process. The quantitative performance of the Print White technique was found to be significantly poorer than the other three. The ESP of the PW, under the conditions analyzed, was found to be 56.3, while the average of the other three is 46.1. The error performance of the PLW approach was found to be subjectively superior to the Print White technique and comparable to the Previous Line technique. The NDPL has superior legibility and shows promise for improved overall error performance. Author (GRA)

N82-18562# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
PRELIMINARY DESIGN OF A HYDRAULIC POWER SUPPLY FOR A LAMINAR JET ANGULAR RATE SENSOR
T. R. Small, W. O. Wilkinson, F. F. Mark, and R. A. Makofski Adelphi, Md. HDL Nov. 1981 45 p refs
(Contract N00024-78-C-5384; DA Proj. 1L1-62120-AH-25)
(AD-A108729; HDL-CR-80-384-2) Avail: NTIS HC A03/MF A01 CSCL 14/2

The preliminary design of a hydraulic power supply for a laminar jet angular rate sensor is described. The requirements upon which this design was based are that the power supply provide stable pressure and flow rates (of the order of 10 psi and 1 l min) over the military temperature range (-60 F to 180 F). Reliability, safety, small size, and low cost are also factors that were considered. State-of-the-art equipment and passive control are specified. Also presented are test plans for measuring the performance of the proposed power supply and a limited literature review of potential hydraulic fluids.
Author (GRA)

N82-18563# Maryland Univ., College Park. Computer Vision Lab.
ON CONNECTIVITY PROPERTIES OF GRAYSCALE PICTURES
Azriel Rosenfeld Sep. 1981 17 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A108602; TR-1097; AFOSR-81-0796TR) Avail: NTIS HC A02/MF A01 CSCL 14/5

A grayscale digital picture is called 'connected' if it has only one connected component of constant gray level that is maximal, i.e., not adjacent to any component of higher gray level. This note establishes some equivalent conditions for connectedness, and also defines a grayscale generalization of the genus in terms of sums of local property values.
Author (GRA)

N82-18564# British Aerospace Dynamics *Group, Bristol (England). Space and Communications Div.
IMAGING MICROWAVE RADIOMETER. PHASE A STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
C. R. Francis Paris ESA Jul. 1980 50 p refs Prepared in cooperation with Dornier-Werke G.m.b.H., Friedrichshafen, West Germany, B and W Electronik and Tech. Univ. of Denmark Original contains color illustrations
(Contract ESA-4243/80/F-CG(SC))
(ESS/SS-1006; ESA-CR(P)-1468) Avail: NTIS HC A03/MF A01

An imaging microwave radiometer, a passive microwave instrument proposed for inclusion in the sensor payload of the Coastal Ocean Monitoring Satellite System (COMSS) spacecraft, was studied. The instrument detects microwave radiation at 5 frequencies in the range 6.8 to 36.5 GHz, each at vertical

and horizontal polarization, and has an optional facility for measurements at 90 GHz. Results show that the instrument meets the experiment requirements proposed by ESA and meets the accommodation constraints of the COMSS payload.
Author (ESA)

N82-18565# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATION ON THE FUNCTIONING OF GOLD-TIN SUPERCONDUCTING FILMS FOR THE MEASUREMENT OF SECONDARY SONIC SHOCK WAVES IN He2 FLOW [UNTERSUCHUNGEN UEBER DIE FUNKTIONSWEISE VON SUPRALEITENDEN GOLD-ZINN-FILMEN ZUR MESSUNG VON SECOND SOUND-STOSSWELLEN IN He2-STROEMUNGEN]
Till Schmeling May 1981 53 p refs In GERMAN
(MPIS-8/1981; ISSN-0436-1199) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,75

The function of evaporated gold-tin superconducting films to detect second sound signals was investigated. It is shown that by annealing of the critical probe current can be lowered and at the same time the sensitivity of the probe at low temperatures can be increased. E.A.K.

N82-18566# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
A WATER VAPOR MONITOR USING DIFFERENTIAL INFRARED ABSORPTION
Darrel E. Burch and David S. Goodsell Sep. 1981 36 p refs
(Contract EPA-68-02-3238)
(PB82-114422; EPA-600/2-81-162) Avail: NTIS HC A03/MF A01 CSCL 14B

A water vapor monitor was developed with adequate sensitivity and versatility for a variety of applications. Two applications are the continuous monitoring of water in ambient air and the measuring of the mass of water desorbed from aerosol filters. The sample gas may be held static, or flow continuously through the 56 cc sample cell, temperature controlled at 45 C. Infrared energy from a tungsten-iodide bulb passes through a rotating filter wheel and the sample cell to a PbS detector. The infrared beam passes through the sample gas twice to produce a total optical path of 40 cm. The infrared beam passes alternately through two semicircular narrow bandpass filters. Absorption by the water vapor in the sample produces a 30-Hz modulation of the detector signal that is proportional to the water concentration. The maximum concentration that can be measured accurately is approximately 5%. GRA

N82-18567# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
AN INEXPENSIVE PHOTOELECTRIC REMOTE TILT METER Final Report
James D. Bergen Nov. 1980 5 p ref
(PB82-103649; FSRN-PSW-347) Avail: NTIS HC A02/MF A01 CSCL 14B

An inexpensive remote reading level capable of indicating and recording tilt components can be assembled from a photoresister and indicator lamp aligned in a tube containing a mercury surface. The device is useful to determine corrections needed for readings of meteorological equipment mounted on portable towers or in aircraft. GRA

N82-18568# Rockwell International Corp., Newbury Park, Calif. Environmental Monitoring and Services Center.
DEVELOPMENT OF A MULTIDETECTOR PETROLEUM OIL IN WATER MONITOR Final Report, May 1978 - Jan. 1981
Robert W. Melvold Sep. 1981 90 p refs
(Contract EPA-68-03-2648)
(PB82-105206; EPA-600/2-81-206) Avail: NTIS HC A05/MF A01 CSCL 14B

A prototype petroleum oil-in-water monitoring system that continuously measures oil (whether free, suspended, dissolved, or emulsified) in water carrying a variety of potential interfering substances was developed. An extensive desk-top survey of commercially available oil monitors was carried out. Three devices were selected for thorough laboratory evaluation: (1) Sigrist Fluorescence Monitor Model FLJ, (2) CE Invalco D.O.W. Monitor, and (3) Horiba OCMA-25 Oil Content Monitor. The construction of a flow loop and its operation, the installation of the selected detectors in the breadboard system, the development of a data retrieval system, the calibration methodology employed, the initial checkout of the detectors, and the extensive multidetector evaluation of each detector's performance for quantifying petroleum oil in the presence of impurities and other interferents are described. GRA

N82-18569# Science Research Council, Chilton (England). Physics Apparatus Group.
A HIGH RESOLUTION, HIGH COUNTING RATE BIDIMENSIONAL, MWPC IMAGING DETECTOR FOR SMALL ANGLE X-RAY DIFFRACTION STUDIES
J. E. Bateman, J. F. Connolly, E. C. Sawyer, and R. Stephenson 1981 25 p refs
(PB82-120866; RL-81-053) Copyright. Avail: Issuing Activity CSCL 14B

The performance of a 40,000 sq mm X-ray imaging multiwire proportional chamber gamma camera with applications in small angle X-ray diffraction and scattering is reported. With quantum energies of about 8 keV, high spatial resolution with a capability for data taking at about, or > 350 kHz is reported. The detection efficiency is about 75% and the detector operates as a sealed unit with a long lifetime. GRA

N82-18570# National Bureau of Standards, Washington, D.C.
DIMENSIONS: VOLUME 65, NUMBER 5
Jul. 1981 29 p refs
(PB82-120387; NBS-DIM-65-5) Avail: NTIS HC A03/MF A01 CSCL 14B

Short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications are featured. The table of contents for the current issue is as follows: Getting More for less; Preserving the past; NBS Research forges strong link with industry; NEW NBS instrument monitors electromagnetic radiation; Verification procedures for federal interface standards; Hybrid planar-cylindrical scanning technique; Spin dependent-mean free paths; New SRM aids detection of PAH's; Copper 'Benchmark' SRM's available; Conferences; Publications; and Newsbriefs. GRA

N82-18571# National Bureau of Standards, Washington, D.C. National Engineering Lab.
MATERIALS FOR INSTRUMENTATION FOR FOSSIL ENERGY TECHNOLOGIES. A REVIEW AND PROGRAM PLAN OF RESEARCH AND DEVELOPMENT NEEDS
H. P. R. Frederikse, P. K. Schenck, G. R. Burns, R. R. Dils, and J. R. Whetstone Sep. 1981 135 p refs
(Contract EA-77-A-01-6010)
(PB82-116229; NBSIR-81-2348) Avail: NTIS HC A07/MF A01 CSCL 14B

The materials problems related to instrumentation for Fossil Energy Facilities are reviewed. Requirements for measurement of process parameters (flow, temperature, pressure, chemical composition), of construction material properties, and of fuel characteristics are discussed. The main part of the report is a suggested program plan for pertinent materials R&D. Short descriptions of the various Fossil Energy Processes, listing of present research activities, and a set of 6 case studies are presented in an appendix. GRA

N82-18572# National Bureau of Standards, Washington, D.C. National Engineering Lab.
MEASUREMENT AND EVALUATION METHODS FOR AN ANGULAR ACCELEROMETER Final Report, 1 Aug. - 30 Dec. 1980
John D. Ramboz Aug. 1981 75 p refs
(Contract DOT-HS-9-021931A)
(PB82-115973; NBSIR-81-2337) Avail: NTIS HC A04/MF A01 CSCL 14B

A transducer which measures angular acceleration along one axis was investigated to assess three of its performance characteristics, viz., sensitivity factor, amplitude linearity, and response to linear (non-angular) input accelerations. Accelerometer specifications and response theory are presented. Test philosophy and methodology are discussed along with measurement

results. Tests were conducted over a frequency range from 1.5 to 100 Hz and an acceleration range from 64 to 5000 rad/square second. Generally, the performance observed was in agreement with the manufacturer's preliminary specifications. GRA

N82-18573# Geological Survey, Reston, Va. Water Resources Div.
MULTI-SALINE SAMPLE DISTILLATION APPARATUS FOR HYDROGEN ISOTOPE ANALYSES: DESIGN AND ACCURACY Water Resources Investigations
Afifa Afifi Hassan Apr. 1981 10 p refs
(PB82-115460; USGS/WRD/WRI-81-086) Avail: NTIS HC A02/MF A01 CSCL 14B

A distillation apparatus for saline water samples was designed and tested. Six samples may be distilled simultaneously. The temperature was maintained at 400 C to ensure complete dehydration of the precipitating salts. Consequently, the error in the measured ratio of stable hydrogen isotopes resulting from incomplete dehydration of hydrated salts during distillation was eliminated. GRA

N82-18574# Radian Corp., Durham, N.C.
HERL BIOLOGICAL EXPOSURE CHAMBER CONCEPTUAL DESIGN
R. M. Parks Oct. 1981 49 p
(Contract EPA-68-02-3171)
(PB82-114646; EPA-600/2-81-234) Avail: NTIS HC A03/MF A01 CSCL 14B

Because of the current interest in biotesting of potentially hazardous air pollutants, biological exposure chambers that can be used to expose test organisms to the secondary aerosol effluent of the MARC (Mobile Aerosol Reaction Chamber) were designed. The conceptual design of the biological exposure chambers is described along with the chamber design and rationale behind that design. The connecting of the biochambers to the MARC is also discussed. GRA

N82-18575# Colorado School of Mines, Golden. Dept. of Physics.
SMALL SIZE-RANGE EXTENSION OF AN OPTICAL PARTICLE COUNTER Final Report, Oct. - Mar. 1981
James T. Brown, Jr. Aug. 1981 20 p refs
(Grant EPA-R-807089)
(PB82-103623; EPA-600/2-81-144) Avail: NTIS HC A02/MF A01 CSCL 14B

The object of the study was to improve the small particle sensitivity and resolution of a white light optical particle counter. The particular counter chosen for study was the model 208 manufactured by Climet Instruments. GRA

N82-18236*# Institut d'Aeronomie Spatiale de Belgique, Brussels.
GRILLE SPECTROMETER
M. Ackerman and A. Girard (ONERA) *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14B

N82-18237*# Centre National de la Recherche Scientifique, Paris (France). Service d'Aeronomie.
WAVES IN THE OH EMISSIVE LAYER
M. Herse *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

N82-18239*# European Space Conference, Paris (France).
METRIC CAMERA EXPERIMENT
M. Reynolds *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

N82-18250*# Laboratoire d'Aerothermique du C.N.R.S., Meudon (France).
VERY WIDE FIELD CAMERA
G. Courtes *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

N82-18252*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ACTIVE CAVITY RADIOMETER
R. C. Willson *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14B

N82-18263*# Clinical Research Centre, London (England).
PERSONAL MINIATURE ELECTROPHYSIOLOGICAL TAPE RECORDER
H. Green *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14E

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-18576 California Univ., Berkeley.
SEMICONDUCTOR INJECTION LASERS WITH A CIRCULAR RESONATOR: A STUDY OF GaAs-(GaAl)As DIELECTRIC WAVEGUIDES AND THEIR INCORPORATION INTO A LASER RESONATOR Ph.D. Thesis
Andrew Shuh-Huei Liao 1981 195 p
Avail: Univ. Microfilms Order No. 8200184

A semiconductor injection laser with a circular resonator for integrated optics applications is studied. Electromagnetic wave propagation in dielectric rectangular waveguides is analyzed by means of an improved approximate analysis. The effect of the index difference and the aspect ratio on the modal configuration of a dielectric rectangular waveguide is examined. Propagation characteristics of both straight and curved GaAs-(GaAl)As high mesa waveguides are investigated. Field distribution, propagation constant and radiation losses of the guided modes are determined. Dissert. Abstr.

N82-18577*# Old Dominion Univ., Norfolk, Va. School of Sciences and Health Professions.
THEORETICAL STUDIES OF SOLAR-PUMPED LASERS Progress Report, 16 Jul. 1981 - 15 Jan. 1982
Wynford L. Harries Feb. 1982 29 p refs
(Grant NsG-1568)
(NASA-CR-168554; PTR-82-2) Avail: NTIS HC A03/MF A01 CSCL 20E

Solar-pumped lasers were investigated by comparing experimental results from pulse experiments with steady state calculations. The time varying behavior of an IBr laser is studied. The analysis is only approximate, but indicates that conditions occurring in a pulsed experiment are quite different from those at steady state. The possibility of steady-state lasing in an IBr laser is determined. The effects of high temperatures on the quenching and recombination rates are examined. Although uncertainties in the values of the rate coefficients make it difficult to draw firm conclusions, it seems steady state running may be possible at high temperatures. S.L.

N82-18578*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE LASER POWER TRANSMISSION SYSTEM STUDIES
M. D. Williams, ed. and E. J. Conway, ed. Feb. 1982 210 p refs Symp. held in Hampton, Va., 14-15 Oct. 1981
(NASA-CP-2214; L-15030) Avail: NTIS HC A10/MF A01 CSCL 20E

Power transmission by laser technique is addressed. Space to Earth and space to space configurations are considered. For individual titles, see N82-18579 through N82-18586.

N82-18579*# Ball Aerospace Systems Div., Boulder, Colo.
PRELIMINARY STUDY ON THE USE OF LASERS FOR THE TRANSMISSION OF POWER

In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 15-32 (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

The use of lasers in space is outlined. Possibilities and ideas are presented. The economic payoff of lasers in space in supplying energy for the Earth is considered. Possible operational advantages and economies for the user of space to space energy transmission are addressed. The development of large space power stations to beam energy to Earth is discussed. Applications on Earth and comparisons with microwave systems are emphasized. N.W.

N82-18580*# Schafer (W. J.) Associates, Inc., Arlington, Va.
A STUDY TO SURVEY NASA LASER APPLICATIONS AND IDENTIFY SUITABLE LASERS FOR SPECIFIC NASA NEEDS
In NASA. Langley Research Center Space Laser Transmission System Studies Feb. 1982 p 33-44 refs (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

All potential applications of high power lasers which might, in particular, use the JPL copper-halide laser under development were considered for study. A wide range of applications were identified with strong emphasis on remote sensing applications. Power beaming and laser propulsion were also identified as major areas of interest to NASA. N.W.

N82-18581*# Schafer (W. J.) Associates, Inc., Arlington, Va.
INVESTIGATION OF POSSIBILITIES FOR SOLAR-POWERED HIGH-ENERGY LASERS IN SPACE
In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 45-56 (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

Solar pumped lasers were investigated. The literature was reviewed for possible solar laser candidates from optical pumping experiments. A baseline CO electric discharge laser system was shown to be technically feasible. The most promising direct solar pumped laser was identified to be CF3I. Using the 'STAG' solar laser concept and CF3I, it was found that such a system could be weight competitive with the baseline CO laser system. N.W.

N82-18582*# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
DESIGN INVESTIGATION OF SOLAR-POWERED LASERS FOR SPACE APPLICATIONS
In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 77-84 (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

The feasibility of using solar powered continuous wave (CW) lasers for space power transmission was investigated. Competing conceptual designs are considered. Optical pumping is summarized. Solar pumped Lasant type lasers are outlined. Indirect solar pumped lasers are considered. N.W.

N82-18583*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
UTILITY AND TECHNOLOGY FOR A SPACE CENTRAL POWER STATION
Paul F. Holloway and L. Bernard Garrett *In its* Space Laser Power Transmission System Studies Feb. 1982 p 85-122 refs Presented at the Second AIAA Conf. on Large Space Platforms, Feb. 1981 (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

The technological and economical impacts of a large central power station in Earth orbit on the performance and cost of future spacecraft and their orbital-transfer systems are examined. It is shown that beaming power to remote users cannot be cost-effective if the central power station uses the same power generation system that would be readily available for provision of on-board power. Laser transmitters/receivers to make central power stations feasible are considered. The cost-effectiveness of meeting Earth-orbiting spacecraft electrical demands from a central power station was analyzed, indicating that this application cannot justify the investment required for the central station. Key technology needs which must be met to enable a viable central power station in the future are identified. N.W.

N82-18584*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
LASER ROCKET SYSTEM ANALYSIS
In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 123-134 refs (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

Potential national space transportation budget savings offered by laser rocket systems are considered. Orbital payload transportation costs, requiring 16 MW laser power space based or 37.5 MW ground based, are reduced by a factor of 2.4. The SPS orbital transportation costs, requiring 490 MW laser power space based or 1000 MW ground based, are reduced by factors up to 7. Technology advancement is indicated for the laser, thruster, large lightweight adaptive mirror, and pointing and tracking. N.W.

N82-18585*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
LASER POWER CONVERSION SYSTEM ANALYSIS
In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 145-158 refs (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

Orbit to orbit and orbit to ground laser power conversion systems and power transfer are discussed. A system overview is presented. Pilot program parameters are considered: SLPS assumptions are listed, a laser SPS overview is presented, specifications are listed, and SLPS coats are considered. N.W.

N82-18586*# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
SPACE LASER POWER TRANSMISSION
In NASA. Langley Research Center Space Laser Power Transmission System Studies Feb. 1982 p 165-174 refs (For primary document see N82-18578 09-36)
Avail: NTIS HC A10/MF A01 CSCL 20E

Proposed laser transmission applications are reviewed. Technologies for laser power transmissions are assessed. Feasible laser mission systems are set out. Components by wavelength are summarized. Feasible space to space laser power transmission systems are summarized. Space laser transmitter masses for 1 MW and 100 KW output power are summarized. N.W.

N82-18587# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
INVESTIGATION OF A 460 nm XeF LASER Final Report
C. H. Fisher Jun. 1981 86 p refs
(Contract N00014-78-C-0343; NR Proj. 395-568)
(AD-A108132; MSNW-1136) Avail: NTIS HC A05/MF A01 CSCL 20/5

The rare gas halide lasers have been extensively developed into efficient, high energy lasers operating in the near ultraviolet region of the spectrum. Until recently, most of the development in XeF had concentrated on the B>X transition at 350 micrometers. There is an even longer wavelength transition in XeF, the C-A continuum band at 460 micrometers. This transition has had several advantages over the shorter wavelength transitions in existing XeF and KrF lasers, including tunability and optimum atmospheric and aquatic transmission. The purpose of this program was to demonstrate lasing on the C-A transition of XeF and to gather the kinetic data necessary to optimize the laser performance. Author (GRA)

N82-18588# Physical Sciences, Inc., Woburn, Mass.
HIGH TEMPERATURE IN ABSORPTION MEASUREMENTS Final Report, 15 Aug. 1980 - 30 Jun. 1981
Robert H. Krech and Evan R. Pugh Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Sep. 1981 64 p refs
(Contract F04611-80-C-0042)
(AD-A108601; PSI-TR-279; AFRPL-TR-81-79) Avail: NTIS HC A04/MF A01 CSCL 20/5

The temperature dependence of the absorption coefficient of water vapor was measured to determine the feasibility of using water vapor as a molecular seed to couple 10.6 micrometer CO2 laser radiation into a propellant for use in a high performance

laser heated rocket thruster. A series of shock tube experiments were performed to determine the temperature dependence of the absorption coefficient of water vapor at high temperatures on the P(16), P(18) and P(20) 10.6 micrometer CO2 laser transitions. Measurements were made behind both incident and reflected shock waves encompassing a temperature range from 600 K to 3700 K at pressures from 1 to 40 atmospheres in 2, 5, and 10 mole percent water vapor in argon gas mixtures. Within the spectral range (944 to 948 cm) covered, no significant variation in the absorption coefficient was observed as a function of laser wavelength, water concentration, total pressure, or collision partner. Observations suggest that the water lines are sufficiently broadened to act as a continuum absorber under conditions to be found in a laser-heated rocket thruster. The measured laser high temperature absorption coefficients are 50 percent lower than the values obtained from the Ludwig empirical curve fit to low resolution data. GRA

N82-18589# General Electric Co., Syracuse, N.Y. Electronics Lab.

PULSED HETERODYNE CO2 LASER/SCANNER SYSTEM

G. B. Jacobs Sep. 1981 46 p

(Contract F19628-80-C-0184; AF Proj. 6670)

(AD-A108186; SCIENTIFIC-1; AFGL-TR-81-0262) Avail: NTIS HC A03/MF A01 CSCL 17/5

Ten micron heterodyne laser radar offers a new type of remote sensor that can add significantly to our characterization and understanding of the atmosphere. For example, accurate range resolved measurements of air velocity via the Doppler of aerosol backscatter to distances of tens of kilometers will yield a better understanding of wind shear. This report describes the design of an operational laser radar trailer facility to permit these measurements. This is a design evaluation report intended to aid the government in judging the capability of our design to meet the government's requirements. The system is to incorporate the high pulse repetition frequency, high power electron beam injection CO2 laser developed earlier by the General Electric Company. The system is to be assembled in a trailer to be supplied by the government and will permit hemispherical scanning with a laser beam of less than .002 degrees beamwidth. Author (GRA)

N82-18590# IBM Research Lab., San Jose, Calif.

LASER HOLE BURNING SPECTROSCOPY: A HIGH RESOLUTION PROBE OF MOLECULAR ENVIRONMENTS Final Report, 1 Jun. 1979 - 1 Jun. 1981

R. M. Macfarlane and R. M. Shelby 1 Jun. 1981 57 p refs

(Contract F49620-79-C-0108; AF Proj. 2303)

(AD-A108549; AFOSR-81-0790TR) Avail: NTIS HC A04/MF A01 CSCL 20/5

Laser induced hole burning in optical absorption bands of low temperature solids was investigated mechanisms for population hole burning, the interactions with the environment which limit the hole widths and the use of hole burning for ultra high resolution spectroscopy were emphasized. Examples of hole burning in new classes of materials are presented. Hole recovery was used to determine nuclear spin lattice relaxation rates in praseodymium doped crystals. For allowed optical transitions (e.g., singlet states of zinc porphyrin, dibromoindigo and color centers in alkali halides). For longer lived optical levels in crystalline materials, e.g., those containing rare Earth ions, the hole widths are narrower and are limited by dynamical interactions with surrounding nuclei. In amorphous materials such as europium doped silicate glass, hole widths are much broader, limited by low frequency tunneling motions. Hole burning measurements were complemented by time domain coherent transient (photon echo, and optical free decay) measurements of homogeneous linewidths. E.A.K.

N82-18591# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.

WAVELENGTH SCALING FOR REACTOR-SIZE LASER FUSION TARGETS Interim Report

J. H. Gardner and S. E. Bodner 10 Dec. 1981 16 p refs

(Contract DE-AI08-79DP)

(AD-A108547; NRL-MR-4623) Avail: NTIS HC A02/MF A01 CSCL 18/1

The symmetric implosion of pellet shells will require sideways thermal transport smoothing of any laser intensity nonuniformities. A scaling law shows a surprisingly strong laser wavelength dependence for this smoothing mechanism; it places a large premium on the use of longer wavelength near-infrared lasers. This smoothing requirement conflicts with the advantages of shorter laser wavelengths for controlling deleterious plasma instabilities. Author (GRA)

N82-18592# Rochester Univ., N. Y. Dept. of Physics and Astronomy.

COMPETITION EFFECTS IN LASERS Final Report, 1 Oct. 1980 - 30 Sep. 1981

L. Mandel Nov. 1981 11 p refs

(Grant AF-AFOSR-0026-81; AF Proj. 2301)

(AD-A108658; AFOSR-81-0804TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

This Final Report describes research. The first two-time photoelectric correlation measurements of a ring laser were completed during this period, which demonstrated the effect of mode competition in modifying the characteristics of a laser. Theoretical quantum treatments of a two-mode ring laser, and of a laser with coupled transitions were completed, and phase transition effects in a laser exhibiting optical bistability, and one with a saturable absorber, were investigated. The research resulted in four publications in the scientific literature, and 11 lectures describing various aspects of the research were presented at scientific meetings and research seminars. These are all listed in the report. GRA

N82-18593# Stanford Univ., Calif. Lab. of Physics.

LASER PHYSICS AND LASER SPECTROSCOPY Final Technical Report, Jan. 1980 - Feb. 1981

R. L. Byer Jul. 1981 41 p refs

(Grant AF-AFOSR-0144-80; AF Proj. 2301)

(AD-A108374; GL-3298) Avail: NTIS HC A03/MF A01 CSCL 20/5

Accomplishments are summarized for the following areas: (1) stimulated Raman frequency conversion; (2) single frequency Nd:YAG by injection locking; (3) transient injection locking; and (4) improved resonator design using the radial birefringent element. Work initiated in single crystal fiber growth and in laser ionization mass spectroscopy is also discussed. GRA

N82-18594# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.

STUDY OF LASER CREATED METAL VAPOUR PLASMAS Annual Technical Report, 1 Oct. 1980 - 30 Sep. 1981

R. M. Measures Sep. 1981 87 p refs

(Grant AF-AFOSR-0057-80; AF Proj. 2301)

(AD-A108588; AFOSR-81-0789TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

Laser resonance saturation represents a powerful new form of interaction that can lead at high densities to extremely rapid and efficient coupling of laser energy into both gases and plasmas. A comprehensive experimental facility and a theoretical program for studying these interactions in alkali-vapors was developed. Preliminary calculations have suggested that laser resonance saturation could lead to extensive ground level burnout of certain kinds of atoms or ions and that this could lead to the creation of a ground level inversion in these species. This approach could lead to the development of short wavelength lasers of high quantum efficiency. Author (GRA)

N82-18595# Maryland Univ., College Park. Dept. of Electrical Engineering.

INVESTIGATION OF COLD CATHODES FOR LONG LIFE CO SUB 2 WAVEGUIDE LASERS Annual Summary Report

U. Hochuli Nov. 1981 17 p

(Contract N00014-79-C-0312)

(AD-A108692) Avail: NTIS HC A02/MF A01 CSCL 20/5

Within a year's time the life of the 1.5W CO2 waveguide laser was extended from 1500 hours to over 8000 hours. After this period some loose, sputtered cathode material is still found in the laser. This situation can not be tolerated for lasers used in the field. Discharge tube observations indicate that other cathode materials exist that seem to produce sputtering products with better wall adhesion properties. Author (GRA)

N82-18596# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
FORMULATION OF NORMALIZED NON-LINEAR FREE ELECTRON LASER EQUATIONS Interim Report
C. M. Tang and P. Sprangle 9 Dec. 1981 43 p refs
(ARPA Order 3817)
(AD-A108358; NRL-MR-4670) Avail: NTIS HC A03/MF A01 CSCL 20/5

The general non-linear self-consistent equations describing the Free electron laser (FEL) in the steady state amplifying configuration is derived with the space charge effects and all the efficiency enhancement schemes: (1) a spatially varying wiggler amplitude and/or period and (2) a d.c. electric field E sub DC (z) = (-(del phi sub DC)/del z)e-carat sub z. All the efficiency enhancement schemes are shown to be somewhat equivalent. For a variable period magnetic wiggler, the FEL equations can be appropriately normalized to a three parameter set of coupled equations. All operating regimes are covered by these normalized equations. The condition for space charge to be unimportant is given. In the absence of the space charge effects, the three parameter set of equations reduces to a two parameter set. The inclusion of additional efficiency enhancement schemes increases the number of parameters to describe the FEL. Curves showing the efficiency, radiation amplitude and growth rate will be presented. Author (GRA)

N82-18597# Colorado Univ. at Boulder.
LASER SPECTROSCOPY OF SOLID STATE ELECTROLYTES Final Report, 1 Oct. 1976 - 30 Sep. 1981
James F. Scott 9 Dec. 1981 6 p refs
(Grant AF-AFOSR-3105-77; AF Proj. 2301)
(AD-A108981; AFOSR-81-0862TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Optical spectroscopy and electrical and thermal measurements are described on the solid state electrolytes ('superionic conductors') such as silver tungstate and related compounds.
Author (GRA)

N82-18598# Centro Informazioni Studi Esperienze, Milan (Italy). Servizio Documentazione.
QUASI-ELASTIC LASER LIGHT DIFFUSION [DIFFUSIONE QUASI ELASTICA DI LUCE LASER]
M. Giglio 1981 14 p refs In ITALIAN Presented at Assoc. Ital. di Sci. e Technol. delle Macromolecole, Gargnano, Italy, 25-29 May 1981
(Contract CNR/CISE-80-02017.95)
(CISE-1711) Avail: NTIS HC A02/MF A01

Spectroscopy of the fluctuations in intensity of laser light diffusion is considered. The autocorrelation, or power, spectrum of the fluctuations in intensity is measured and its relation to fluctuations in electromagnetic field intensity analyzed mathematically. The experimental apparatus is described. J.D.H.

N82-18599# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
PULSED AND CW SEMICONDUCTOR LASER RANGE FINDING FOR SPACE FLIGHT APPLICATIONS [GEPULSTE UND CW-HALBLEITERLASER-ENTFERNUNGSMESSER FUER RAUMFAHRTANWENDUNGEN]
S. Manhart, T. Halldorsson, G. Sepp, and D. Siemsen 1981 13 p ref Partly in GERMAN and ENGLISH Presented at Laser 81, June 1981
(MBB-UA-563-81-O) Avail: NTIS HC A02/MF A01

The application of a radar range equation and the operational possibilities of the semiconductor laser range finder in space flights was demonstrated. Pulse recordings and phase measurements were analyzed for performance and specific advantages and disadvantages on different mission tasks. It is disclosed that for the detection and macroscopic measurements of reflector targets a pulsed laser system with pulse time measurments, and for the precision range finding a modulated continuous wave laser with phase measurement are the preferred methods. A concept in which both measuring methods, together with a biaxial visibility scanning are integrated into units of measurement is presented. Transl. by E.A.K.

N82-18600# European Space Agency, Paris (France).
MEASUREMENTS OF LIDAR BACKSCATTERING FROM CLOUDS Thesis - Fachhoschule, Munich
Egmont Wolff Oct. 1981 75 p refs Transl. into ENGLISH of "Lidar - Rueckstreumessungen an Wolken", Rept. DFVLR-Mitt-80-12 DFVLR, Oberpfaffenhofen, West Germany, Jul. 1980 95 p
(ESA-TT-689; DVFLR-Mitt-80-12) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 17

The operating principles, main elements (laser and detectors) and theoretical characteristics of the system are described. On-line data acquisition facilities are discussed. Two telescopes are used simultaneously to receive the parallel and perpendicular components of the polarized cloud backscatter signatures. Details are given on calibrating the system and on how to distinguish between ice and water clouds from polarization measurements. Polarization and multiple scattering effects are discussed.
Author (ESA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-18601* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MOVING BODY VELOCITY ARRESTING LINE Patent
Reid A. Hull, inventor (to NASA) Issued 8 Dec. 1981 4 p Filed 28 Dec. 1979 Supersedes N80-18399 (18 - 09, p 1145)
(NASA-Case-LAR-12372-1; US-Patent-4,304,320; US-Patent-Appl-SN-108107; US-Patent-Class-188-371; US-Patent-Class-57-906; US-Patent-Class-244-110C; US-Patent-Class-280-805) Avail: US Patent and Trademark Office CSCL 13I

The arresting of a moving body is improved through the use of steel cables that elongate to absorb the kinetic energy of the body. A sleeve surrounds the cables, protecting them from chafing and providing a failsafe energy absorbing system should the cables fail.
Official Gazette of the U.S. Patent and Trademark Office

N82-18602 Rensselaer Polytechnic Inst., Troy, N. Y.
A COMPLETELY DEFORMABLE TIMOSHENKO BEAM TYPE SLIDER CRANK MECHANISM Ph.D. Thesis
Gabriel O. Amazigo 1981 177 p
Avail: Univ. Microfilms Order No. 8200456

The dynamic response of an elastic slider crank mechanism was investigated. The crank and connecting rod are assumed to deform axially and flexurally. The flexural vibrations include shear deformation and rotary inertia according to the theory of S. P. Timoshenko. External force was applied to the rigid slider which travels in presence of dynamic friction between two parallel, deformable and/or rigid, guides. R. D. Mindlin and L. E. Goodman's method for time dependent boundary conditions (forced vibrations) was applied at the fixed and pinned connections of the mechanism. All the pinned connections are assumed to be frictionless. One of the advantages of the procedure presented is that it can be applied to, and/or extended to, a more complex linkage.
Dissert. Abstr.

N82-18603*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
JT9D CERAMIC OUTER AIR SEAL SYSTEM REFINEMENT PROGRAM Progress Report, Jan. 1979 - Feb. 1981
W. O. Gaffin 27 Jan. 1982 84 p refs
(Contract NAS3-20630)
(NASA-CR-165554; PWA-5515-165) Avail: NTIS HC A05/MF A01 CSCL 11A

The abradability and durability characteristics of the plasma sprayed system were improved by refinement and optimization of the plasma spray process and the metal substrate design. The acceptability of the final seal system for engine testing was demonstrated by an extensive rig test program which included thermal shock tolerance, thermal gradient, thermal cycle, erosion, and abradability tests. An interim seal system design was also subjected to 2500 endurance test cycles in a JT9D-7 engine.
T.M.

N82-18604*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PRECISION RECIPROCATING FILAMENT CHOPPER Patent Application
Austin D. McHatton, Arthur L. Newcomb, Jr., and Gregory Schlugge, inventors (to NASA) (Bionetics Corp., Hampton, Va.) Filed 17 Nov. 1981 10 p
(NASA-Case-LAR-12564-2; US-Patent-Appl-SN-322313) Avail: NTIS HC A02/MF A01 CSCL 13I

A chopper for cutting multifilament line is disclosed in which the pull-pull motion of a double edged sliding blade, driven by dual solenoids, provides a chop on each motion. The line is fed by a pair of rollers with one roller being driven. The chopped line length and chop rate are independently controlled. A jet airstream is provided to dispense chopped lengths of line. NASA

N82-18605# Laboratorium Elektronische Ontwikkelingen voor de Krijgsmacht TNO, Oegstgeest (Netherlands).
ANALYSIS AND DESIGN OF HYDRAULIC SERVOSYSTEMS FOR THE IMPROVEMENT OF PULSED MACHINERY FOR THE ARMY [ANALYSE EN ONTWERP VAN HYDRAULISCHE SERVOSYSTEMEN IN HET KADER VAN DE VERBETERING VAN EEN PULSATORINSTALLATIE VAN DE KONINKLIJKE LANDMACHT]
S. J. Uitterdijk 1980 44 p refs In DUTCH; ENGLISH summary
(TDCK-75058; TR-1980-03) Avail: NTIS HC A03/MF A01

The principal behavior of a linear hydraulic motor is analyzed and the manner in which related control systems, applied in various kinds of feedback, can be developed is described. Author

N82-18606# Science Research Council, London (England).
RESEARCH IN TRIBOLOGY AND BEARINGS
Chris Stanton and Harry Chalis 1980 55 p
(PB82-106923; ISBN-0-901660-39-6) Avail: NTIS HC A04/MF A01 CSCL 13I

A cross section of recent and current research in tribology and bearings is reported. The results range from the discovery of basic principles, the essential foundations on which future development will be built, to the directly practical and usable processes and design information. The projects have been grouped, all aspects of tribology are interrelated while it is emphasized that materials and lubrication are vital in the design of bearings and vice versa are implicated. Design and development are implicated on materials, and materials and lubrication. GRA

N82-18607# Cambridge Univ. (England). Dept. of Engineering.
MIXTURE MOTION IN AN ENGINE CYLINDER
H. Daneshyar and D. E. Fuller 1981 44 p refs
(PB82-121146; CUED/A-THERMO/TR-15-1981;
ISSN-0309-6513) Avail: NTIS HC A03/MF A01 CSCL 21G

A hot-wire anemometer was used to measure the gas velocity in an engine model. The calibration law used gave excellent calibrations in wind tunnels when the wire temperature and the air density were varied. Analogue signals (pressure, anemometer output, trigger pulse) from the instrumentation of the engine model were recorded on magnetic tape. A series of computer programs were developed to sample the analogue signals from the tape and to calculate and plot the instantaneous velocities and their means and standard deviations over many engine cycles, the mean velocity and the turbulence intensity, over a period of a cycle, and their means and standard deviations over many cycles. GRA

N82-18608# Cambridge Univ. (England).
EFFECTS OF WELD ECCENTRICITY ON LONGITUDINAL SHRINKAGE
M. P. Wong 1981 68 p refs
(PB82-121153; CUED/S-STRUCT/TR-89-1981;
ISSN-0309-7447) Avail: NTIS HC A04/MF A01 CSCL 13E

The effects of weld eccentricity on longitudinal shrinkage are investigated. Tests on a total of 31 single-pass weld specimens were conducted in 5083 aluminum, with the aim of studying how shrinkage takes place in welded plates. The results were compared with the new theoretical work. The specimens were prepared with either in-plane or out-of-plane weld eccentricity, or both. GRA

N82-18609# Cambridge Univ. (England). Dept. of Engineering.
SHRINKAGE EFFECTS IN BUTT WELDS IN 5083 ALUMINIUM
W. P. Wong 1981 54 p refs
(PB82-121138; CUED/D-STRUCT/TR-91-1981;
ISSN-0309-7447) Avail: NTIS HC A04/MF A01 CSCL 13E

Experimental work carried out at Cambridge, for the A.M.T.E., on shrinkage effects in butt welds in 5083 aluminum are described in detail. Both unbacked and backed butt welds were investigated. Measurements were mainly conducted on longitudinal weld shrinkage. Simple formulae were obtained for calculating the tendon force in single and multipass butt welds. GRA

N82-18610# Cambridge Univ. (England). Dept. of Engineering.
SHRINKAGE EFFECTS IN BEAD-ON-PLATE WELDS IN 5083 ALUMINIUM
M. P. Wong 1981 71 p refs
(PB82-114596; CUED/D-STRUCT/TR.88-1981;
ISSN-0309-7447) Avail: NTIS HC A04/MF A01 CSCL 13E

Experimental work on weld shrinkage effects in 5083 aluminum plates in thickness of 8 and 12 mm are described in detail. The procedure was to lay a central weld down each specimen and measure both longitudinal and transverse shrinkages. Only single- and multi-pass bead-on-plate welds are given in the report. GRA

N82-18611# Cambridge Univ. (England). Dept. of Engineering.
SHRINKAGE EFFECTS IN T-FILLET WELDS IN 5083 ALUMINUM
M. P. Wong 1981 46 p refs
(PB82-114570; CUED/D-STRUCT/TR-92-1981;
ISSN-0309-7447) Avail: NTIS HC A03/MF A01 CSCL 13E

Experimental work on shrinkage effects in T-fillet welds in 5083 aluminum is described in detail. The validity of tendon force concept when applied to welded T-sections was investigated. A simple formula was developed to predict mean compressive residual stresses at the flange of a two-pass T-fillet joint. Reasons were suggested for the cause of randomness of stress gradient direction in the web (stiffener), as measured in stiffened panels. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-18612*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METAL HONEYCOMB TO POROUS WIREFORM SUBSTRATE DIFFUSION BOND EVALUATION
A. Vary, P. E. Moorhead, and D. R. Hull 1982 12 p refs Presented at the Spring Conf. of the Am. Soc. for Nondestructive Testing, Boston, 22-25 Mar. 1982
(NASA-TM-82793; E-959) Avail: NTIS HC A02/MF A01 CSCL 14D

Two nondestructive techniques were used to evaluate diffusion bond quality between a metal foil honeycomb and porous wireform substrate. The two techniques, cryographics and acousto-ultrasonics, are complementary in revealing variations of bond integrity and quality in shroud segments from an experimental aircraft turbine engine. S.L.

N82-18613*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ULTRASONIC INPUT-OUTPUT FOR TRANSMITTING AND RECEIVING LONGITUDINAL TRANSDUCERS COUPLED TO SAME FACE OF ISOTROPIC ELASTIC PLATE Final Report
James H. Williams, Jr., Hira Karagulle, and Samson S. Lee Washington, D.C. NASA Feb. 1982 29 p refs
(Grant NsG-3210)

(NASA-CR-3506) Avail: NTIS HC A03/MF A01 CSCL 14D

The quantitative understanding of ultrasonic nondestructive evaluation parameters such as the stress wave factor were studied. Ultrasonic input/output characteristics for an isotropic elastic plate with transmitting and receiving longitudinal transducers coupled to the same face were analyzed. The asymptotic normal stress is calculated for an isotropic elastic half space subjected to a uniform harmonic normal stress applied to a circular region at the surface. The radiated stress waves are traced within the plate by considering wave reflections at the top and bottom faces. The output voltage amplitude of the receiving transducer is estimated by considering only longitudinal waves. Agreement is found between the output voltage wave packet amplitudes and times of arrival due to multiple reflections of the longitudinal waves. E.A.K.

N82-18614# Rockwell International Science Center, Thousand Oaks, Calif.

PROCEEDINGS OF THE DARPA/AFWAL REVIEW OF PROGRESS IN QUANTITATIVE NONDESTRUCTIVE EVALUATION Final Report, 1 Oct. 1979 - 1 Jan. 1981

R. Bruce Thompson and P. M. Beckham Wright-Patterson AFB, Ohio AFWAL Sep. 1981 608 p refs Conf. held in La Jolla, Calif., 14-18 Jul. 1980

(Contract F33615-80-C-5004; AF Proj. 2418)

(AD-A108741; SC5250.22FR; AFWAL-TR-81-4080) Avail: NTIS HC A99/MF A01 CSCL 20/1

The edited transcripts of the DARPA/AF Review of Progress in the Interdisciplinary Program for Quantitative Nondestructive Evaluation (NDE) held on July 14-18, 1980, at Scripps Institution of Oceanography, La Jolla, California are presented in this document. Several key topics form the core of these presentations and discussions. They include retirement for cause, quantitative ultrasonics, acoustic emission, electromagnetic techniques, and the reliability of NDE techniques for metals, ceramics, and composites. It is believed that this document provides a reasonable summary of NDE research and development currently underway. Author (GRA)

N82-18615# Rome Air Development Center, Griffiss AFB, N.Y.

BAYESIAN RELIABILITY TESTS MADE PRACTICAL

Anthony Coppola Jul. 1981 66 p

(AF Proj. 2338)

(AD-A108150; RADC-TR-81-106) Avail: NTIS HC A04/MF A01 CSCL 14/4

This report provides an understandable, easy to use and believable approach to 'Bayesian' Reliability Testing in order to encourage its practical application. It discusses advantages of the Bayesian approach, guidelines to selecting test risks, procedures for analyzing prior data and methods for structuring test plans. Sample requirements for invoking Bayesian test plans are included. Author (GRA)

N82-18616# Air Force Academy, Colo. Dept. of Mathematical Sciences.

FAILURE-FREE RELIABILITY TESTS Final Report

Nelson S. Pacheco, Salvatore J. Monaco, and Jerry A. Roberts (Davidson College) Sep. 1981 34 p refs

(AD-A108197; USAFA-TR-81-9) Avail: NTIS HC A03/MF A01 CSCL 14/4

A failure-free reliability test is compared with a fixed-time test under a two-parameter Weibull failure distribution. The distribution of the length of the failure-free test is derived, along with conditional failure probabilities for items still operating at the end of the original burn-in time. Graphs are provided for calculating expected test length and conditional failure probabilities. Author (GRA)

N82-18617# Stanford Univ., Calif. Lab. of Physics.

ACOUSTIC MICROSCOPY FOR NONDESTRUCTIVE EVALUATION OF MATERIALS Annual Report, 1 Jul. 1980 - 30 Jun. 1981

C. F. Quate Jul. 1981 60 p refs

(Contract F49620-78-C-0098; ARPA Order 3569; AF Proj. 2306)

(AD-A108423; SU-GL-3295; AFOSR-81-0773TR) Avail: NTIS HC A04/MF A01 CSCL 20/1

This report covers the results of a research program on Acoustic Microscopy directed toward the study of integrated circuits and solid materials. This new type of microscopy permits one to examine microscopic features that are unaccessible in the optical microscope. Thus detail beneath metallization layers as well as the grain boundaries in polished samples can be examined without resorting to chemical etching. Adhesion of thin film is a field where acoustic microscopy will play an important role. Author (GRA)

N82-18618# Middlesex Polytechnique, Enfield (England). Microelectronics Centre.

THE APPLICATION OF CHEMICAL ETCHING TO THE FAILURE ANALYSIS OF SEMICONDUCTOR DEVICES (LITERATURE SURVEY AND PREMILINARY EXPERIMENTS). VOLUME 1: PHASE 1 REPORT

G. P. Shorthouse and J. B. Butcher Paris ESA Oct. 1977 90 p refs 2 Vol.

(Contract ESA-2926/76/NL-HP)

(ESA-CR(P)-1470-Vol-1) Avail: NTIS HC A05/MF A01

The nature and composition of a variety of passivation overcoatings are reviewed including methods of deposition, postdeposition treatment, and properties, such as density and internal stress. The removal of overglazes is considered. Several etchant systems are discussed and etch rate data are presented. Etching mechanisms are explained. The Dry-Ox process is evaluated. This system, utilizing anhydrous hydrogen fluoride, seems the most suitable etching procedure available. Aluminum damage, occurring during device processing, in use, or caused by passivation layer removal, is also discussed along with electrochemical and chemical etching of silicon and of metals. A method for chemical etching analysis of single integrated circuit devices is outlined and techniques for the microscopic examination of junctions are listed. Handling and safety aspects of hydrofluoric acid based etchants are considered. Author (ESA)

N82-18619# Middlesex Polytechnique, Enfield (England). Microelectronics Centre.

THE APPLICATION OF CHEMICAL ETCHING TO THE FAILURE ANALYSIS OF SEMICONDUCTOR DEVICES (EXPERIMENTAL). VOLUME 2: PHASE 2 REPORT

G. P. Shorthouse and J. B. Butcher Paris ESA Jan. 1979 51 p refs 2 Vol.

(Contract ESA-2926/76/NL-HP)

(ESA-CR(P)-1470-Vol-2) Avail: NTIS HC A04/MF A01

The development of an etchant or series of etchants that can be used in the failure analysis of semiconductor devices in order to remove passivating overglazes without causing damage to underlying metal or thermal oxide layers was studied. Various GaAs LED's were decapsulted, the chips removed, and sectioned. The exposed junctions were delineated with dilute nitric acid/iron. Silicon devices were also decapsulated. The nitride passivation layer was removed using and etchant specially formulated to prevent any damage occurring to the underlying metallization. The devices were operated after the nitride removal and voltage contrast scanning electron micrographs of them were produced. The metal layers were removed in a variety of etchants; no satisfactory way was found to remove aluminum from titanium. Author (ESA)

N82-18620# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebereich.

NONDESTRUCTIVE TESTING OF CFRP [ZERSTOERUNGSFREIE PRUEFUNG VON CFK]

Bilgram and H. Zimmermann 2 Mar. 1981 38 p refs In GERMAN

(MBB-BB-477-81-O) Avail: NTIS HC A03/MF A01

Detectible shortcomings in the development of present carbon fiber reinforced plastics are outlined. The following nondestructive research procedures are reported: (1) new X-ray techniques; (2) ultrasonic testing with controlled, narrow band signals; (3) heat flow procedurer of laminates of different thickness; and (4) dielectric analysis on the hardening of carbon fiber reinforced plastics. Transl. by E.A.K.

N82-18621# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

WHAT ENGINEERS SHOULD DO TO ASSURE THE RELIABILITY OF TECHNICAL SYSTEMS [WAS SOLLTE DER

INGENIEUR FUER DIE SICHERHEIT TECHNISCHER SYSTEME TUN]
Wolf-Dieter Pilz 11 May 1981 25 p refs In GERMAN
(MBB-UR-478-81-O) Avail: NTIS HC A02/MF A01

Industrial safety in technical facilities and their implementation are examined. The following topics are discussed: safety aspects of facility policies; present situation of technical safety in operation methods; proposal for a procedural safety method; evaluation of safety conditions; introduction of a general users model; basic considerations; criteria for safety methods in production establishments; logistic of users schedule. Transl. by E.A.K.

N82-18622# Centre Technique des Industries Mecaniques, Senlis (France).
INSPECTION INTEGRATED WITH FABRICATION Final Report [CONTROLE INTEGRE A LA FABRICATION]
Rivenez, Flambard, and Bossuat Mar. 1981 66 p In FRENCH
(CETIM-15-H-194) Avail: NTIS HC A04/MF A01

The automation of nondestructive flaw detection, simultaneous with the machining of a part, was studied. Ultrasonic inspection techniques were used. Results from a number of fabrication processes (turbine shafts, bearing racetracks, large forged parts) confirm the feasibility of this concept. However, the reliability of these inspection procedures and the capability of nonspecialist personnel to carry them out remain in question. Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-18623 California Univ., Berkeley.
THE RESPONSE OF SOLIDS TO ELASTIC/PLASTIC INDENTATION TO ADHESION MEASUREMENTS Ph.D. Thesis
Shu-Sheng Chiang 1981 143 p
Avail: Univ. Microfilms Order No. 8200053

Indentation plasticity and indentation fracture are analyzed. The analysis permits relations to established between material properties (notably hardness, yield strength and elastic modulus) and the magnitudes of the indentation and plastic zone. The predictions demonstrated are fully consistent with observations performed on a wide range of materials. The indentation stress fields are also adapted to generate predictions of indentation fracture thresholds for the three dominant crack types: radial, median and lateral cracks. The predictions are generally consistent with experimental observations. The indentation method was applied to determine the adhesion of interfaces between thin films and substrates. This method provides a quantitative measure of the interface fracture resistance and has the advantage of simplicity and reproducibility. The method was demonstrated for a range of ZnO/Si systems and the adhesion was correlated with acoustic properties. Dissert. Abstr.

N82-18624 California Univ., Berkeley.
TIME DOMAIN VIBRATION TESTING TECHNIQUES IN STOCHASTIC ENVIRONMENT: MODEL REFERENCE ADAPTIVE SYSTEM APPROACH Ph.D. Thesis
Saad Abdel-Rahman Zaghlool 1981 108 p
Avail. Univ. Microfilms Order No. 8200316

Digital schemes for the implementation of time domain vibration testing techniques which are capable of coping with the stochastic nature of their data were studied. The schemes may either employ one shot, accumulative or recursive solution strategies and they appear to have high noise rejection performance and yield consistent and accurate results. Families of recursive algorithms which have fast rate of convergence and are based upon an integral adaption mechanism with constant of decreasing gain and may, or may not, include proporational adaption mechanism are emphasized. Tested recursive algorithms are: series-parallel are emphasized. Tested recursive algorithms are: series-parallel instrumental variable parallel modified parallel extended parallel, extended least square, combined series-parallel/parallel and autoregressive moving average algorithm. The analysis procedure is presented in a unified approach, and makes use of sampled time data of a structure performing free or forced vibration with only finite number of modes excited. Dissert. Abstr.

N82-18625 Illinois Univ. at Urbana-Champaign.
STATIC AND DYNAMIC ANALYSIS OF AXIALLY LOADED WIRE ROPES Ph.D. Thesis
Gary James Butson 1981 107 p
Avail: Univ. Microfilms Order No. 8127559

The static and dynamic behavior of axially loaded wire rope were investigated. The longitudinal, torsional and transverse displacements are determined for a rope which is initially straight in the reference configuration and loaded by an axial force and twisting moment. The static response of wire rope is analyzed using a recently developed technique in which the individual wires in a rope are examined. The effect of friction between adjacent wires on the nonlinear response is determined for the simplest wire rope geometry. The dynamic behavior of wire rope is analyzed for small displacements about the static equilibrium position. Solutions for some initial value problems for suspended wire ropes are determined by means of a Laplace transform with a numerical inversion technique. Solutions for the natural modes of vibration of taut rope are found by an eigenvalue approach. Dissert. Abstr.

N82-18626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GENERAL DESCRIPTION OF NESTABLE COLUMN STRUCTURAL AND ASSEMBLY TECHNOLOGY
Harold G. Bush and Walter L. Heard, Jr. Dec. 1981 16 p refs
(NASA-TM-83255) Avail: NTIS HC A02/MF A01 CSCL 20K

The superior packaging characteristics of nestable column structural elements make this concept attractive for application to missions space shuttle missions requiring large and/or high stiffness, or complex structures. Photographs depict investigations pursued relative to defining structural and assembly technology using these structural elements. The neutral buoyancy facility assembly simulation tests and the large space structure mobile work station are featured. A.R.H.

N82-18627# Technische Hogeschool, Delft (Netherlands).
AN INVESTIGATION OF SHIP PROPELLER FATIGUE Ph.D. Thesis
Hendrik Pieter Egbert Helle [1982] 211 p refs
Avail: NTIS HC A10/MF A01

Fatigue is a major failure cause in controllable pitch propellers, and practically the only cause in fixed pitch monobloc propellers. Two different types of causes are responsible for fatigue failure. Incidental causes are usually due to misuse or improper repairs, for instances, welding in critical areas or insufficiently annealed weldments. A systematic failure due to inherent weakness occurs when a number of aggravating fatigue factors coincide, such as an unusually high dynamic blade load and an exceptionally large undetected casting defect in a critical area plus one or two unfavourable production factors (low materials strength, high residual stresses). The fatigue failure risk of a propeller that enters operation, is determined therefore by its design stress and the quality control procedure it has been subjected to. S.L.

N82-18628# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
A COMPILATION OF STRESS INTENSITY FACTOR SOLUTIONS FOR FLAWED FASTENER HOLES Final Report, Jun. 1978 - Aug. 1981
A. F. Grandt, Jr. and T. E. Kullgren (US Air Force Academy) Nov. 1981 86 p refs
(AF Proj. 2307; AF Proj. 2418)
(AD-A108753; AFWAL-TR-81-4112) Avail: NTIS HC A05/MF A01 CSCL 20/1

Several sets of stress intensity factor solutions are provided for through-the-thickness, corner, and surface flawed holes. Results are given for both remote tensile and crack face pressure loading. It is suggested that the crack face pressure solutions can be used with the linear superposition method to analyze many other

practical crack problems. The superposition technique is demonstrated with several sets of example calculations. Author (GRA)

N82-18629# Iowa Univ., Iowa City. Coll. of Engineering.
DYNAMIC ANALYSIS AND DESIGN OF CONSTRAINED MECHANICAL SYSTEMS Interim Report, period ending Nov. 1978
Edward J. Haug, Roger A. Wehage, Ronald R. Beck (Missouri Univ. -Rolla), and N. C. Barman Warren, Mich. Army-Tank Automotive Command 12 Jun. 1981 57 p refs
(Contract DAAK30-78-C-0096)
(AD-A108685; U-of-Iowa-50; TACOM-TR-12588) Avail: NTIS HC A04/MF A01 CSCL 20/11

A method for formulating and automatically integrating the equations of motion of quite general constrained dynamic systems is presented. Design sensitivity analysis is also carried out using a state space method that has been used extensively in structural design optimization. Both dynamic analysis and design sensitivity analysis and optimization are shown to be well-suited to application of efficient sparse matrix computational methods. Numerical integration is carried out using a stiff numerical integration method that treats mixed systems of differential and algebraic equations. A computer code that implements the method of planar systems is outlined and a numerical example is treated. The dynamic response of a classical slider-crank is analyzed and its design is optimized. Author (GRA)

N82-18630# Iowa Univ., Iowa City. Coll. of Engineering.
DESIGN SENSITIVITY ANALYSIS AND OPTIMIZATION OF CONSTRAINED DYNAMIC SYSTEMS Interim Report, period ending Jun. 1979
N. C. Barman, Edward J. Haug, and Ronald R. Beck (Missouri Univ. -Rolla) Warren, Mich. Army Tank Automotive Command 16 Jun. 1981 180 p refs
(Contract DAAK30-78-C-0096)
(AD-A108684; U-of-Iowa-56; TACOM-TR-12587) Avail: NTIS HC A09/MF A01 CSCL 20/11

In this report, the technical objective is the derivation of a systematic and unified theory and organization of a corresponding general computer program for the design of constrained dynamic systems by judicious selection of the most suitable methods from the following branches of mathematics and mechanics: (a) Optimization Methods, (b) Rigid Body Mechanics, (c) Numerical Integration Methods, and (d) Matrix Manipulation Methods. Accordingly, a method of formulating and automatically integrating the equations of motion and design sensitivity adjoint equations for general constrained dynamic systems is presented. Design sensitivity analysis is carried out using a state-space method that has previously been used for design optimization of linear structural systems. Application of efficient sparse matrix computational methods is shown to be suitable for both dynamic and design sensitivity analyses and for interactive strained system is treated with three degrees of freedom. Algebraic equations prescribing constraints between various bodies are then written and a Lagrangian formulation is used to write the dynamical equations of motion for each body of the system. A stiff predictor-corrector numerical integration (GEAR) algorithm is used for numerical integration of mixed systems of nonlinear differential equations of motion and algebraic equations of constraint (together with spring-damper relations and other user-supplied equations). GRA

N82-18631# Iowa Univ., Iowa City. Coll. of Engineering.
GENERALIZED COORDINATE PARTITIONING IN DYNAMIC ANALYSIS OF MECHANICAL SYSTEMS Final Report, period ending Dec. 1980
Roger A. Wehage, Edward J. Haug, and Ronald R. Beck (Missouri Univ. -Rolla) Warren, Mich. Army Tank-Automotive Command 16 Jun. 1981 197 p refs
(Contract DAAK30-78-C-0096; DAAG29-79-C-0221)
(AD-A108683; U-of-Iowa-75; TACOM-TR-12590) Avail: NTIS HC A09/MF A01 CSCL 20/11

A computer-based method for formulation and efficient solution of nonlinear, constrained differential equations of motion is developed for planar mechanical systems. Nonlinear holonomic constraint equations and differential equations of motion are written in terms of a maximal set of Cartesian generalized coordinates, to facilitate the general formulation of constraints and forcing functions. A Gaussian elimination algorithm with full pivoting decomposes the constraint Jacobian matrix, identifies dependent variables, and constructs an influence coefficient matrix relating variations in dependent and independent variables. This information is employed to numerically construct a reduced system of differential equations whose solution yields the total system dynamic response. A numerical integration algorithm with positive-error control, employing a predictor-corrector algorithm with variable order and step-size, is developed that integrates for only the independent variables, yet effectively determines dependent variables. A general method is developed for dynamic analysis of systems with impulsive forces, impact, discontinuous constraints, and discontinuous velocities. This class of systems includes discontinuous kinematic and geometric constraints that characterize backlash and impact within systems. GRA

N82-18632# Iowa Univ., Iowa City. Coll. of Engineering.
KINEMATIC ANALYSIS OF MECHANICAL SYSTEMS Interim Report, period ending Dec. 1979
Rajiv Rampalli, Edward J. Haug, and Ronald R. Beck (Missouri Univ. - Rolla) Warren, Mich. Army Tank-Automotive Command 16 Jun. 1981 68 p refs
(Contract DAAK30-78-C-0096)
(AD-A108682; U-of-Iowa-60; TACOM-TR-12589) Avail: NTIS HC A04/MF A01 CSCL 20/11

It is intended in this report to develop a method of kinematically analyzing mechanical systems. A computer code that automatically generates a set of nonlinear equations describing the system and solves them, is developed. To demonstrate the accuracy and effectiveness of the method to be developed herein, five sample problems have been solved. While all the sample problems solved are closed-loop mechanical systems, the method described here need not be confined to closed loop mechanical systems or to mechanical systems at all. In fact, the method is applicable to any system whose motion is to be described, provided adequate constraints can be incorporated into the code by the user. Examples of such systems are electro-mechanical systems with relays, switches, etc. Given the topology of a system, the necessary inputs, the method is capable of computing velocities, positions, accelerations and constraint forces on the system. GRA

N82-18633# Southwest Research Inst., San Antonio, Tex.
FATIGUE MICROCRACK BEHAVIOR UNDER THE INFLUENCE OF SURFACE RESIDUAL STRESSES Interim Report 1 Aug. 1980 - 31 Aug. 1981
John E. Hack and Gerald R. Leverant 30 Oct. 1981 77 p refs
(Contract N00014-78-C-0674)
(AD-A108691) Avail: NTIS HC A05/MF A01 CSCL 20/11

Direct observations of the surface crack opening displacement (SCOD) of surface microcracks (2c to approximately 400 microns) have been made on samples of 4140 and HY-130 steels under both cyclic and static loading conditions. Preliminary observations indicate that small cracks which reside entirely within the zone of shot-peen-induced compressive residual stress remain completely closed, even at applied loads approaching the bulk yield stress in HY-130. Results of SCOD measurements on HY-130 specimens which were cycled in an aqueous 3.5% NaCl solution show a large reduction in SCOD (effective delta K) due to a wedging open of the crack by oxides on the crack faces. As far as we know, the results of these near-threshold, low R-ratio tests represent the first direct observations of oxide wedging effects in microcracks and are consistent with independent data for large crack behavior. Predictions using the analytical approach developed earlier in this program give excellent correlation with experimental observations in 4140 steel in the absence of surface residual stresses. Similar analyses are currently being conducted for HY-130. In addition, a boundary-integral program for the direct calculation of crack face displacements is being used to determine complete crack opening profiles in the presence of a surface residual stress gradient. Author (GRA)

N82-18634# Naval Ship Research and Development Center, Bethesda, Md. Structures Dept.
MODELING TECHNIQUES FOR ANALYSIS OF STIFFENED SHELL STRUCTURES, USING COMPUTER PROGRAM ADINA Final Report

Thomas A. Giacofci Nov. 1981 29 p refs
(SF43400001)
(AD-A108728; DTNSRDC-81/070) Avail: NTIS HC A03/MF A01 CSCL 13/3

The beam element available in computer program ADINA is inadequate for transient analysis of eccentrically stiffened shell structures, particularly when the lateral stability of the stiffener is of concern. As an alternative to modeling shell stiffeners with numerous continuum or transition elements, a stiffener modeling technique based on the multipoint constraint option in ADINA is presented. This technique leads to significant reductions in the number of elements and solution degrees of freedom needed for accurate stiffener modeling, yet allows inclusion in the analysis of effects of out-of-plane web distortion, longitudinal warping, and torsion. Stiffeners having various cross sectional geometries and boundary conditions were modeled, and predicted response correlates well with experimental data. The approach is of practical significance for large stiffened shell problems, especially nonlinear analysis. Author (GRA)

N82-18635# Chicago Univ., Ill. Dept. of Geophysical Sciences.
EXPLICIT SOLUTION OF THE INVERSE PROBLEM FOR A VIBRATING STRING
Victor Barcilon Nov. 1981 24 p refs
(Contract N00014-76-C-0034; NR Proj. 041-476)
(AD-A108133) Avail: NTIS HC A02/MF A01 CSCL 20/11

The problem of reconstructing the density rho(x) of a vibrating string of length L from the knowledge of two spectra (lambda n)1 to infinity and (microns n) 1 to infinity is considered. The method of construction relies (I) on a formula for rho at an arbitrary point x=l in terms of the spectra (lambda n (l)) 1 to infinity and (microns n (l)) 1 to infinity associated with the natural frequencies of vibration of the portion (l, L) of the original string and (II) on a set of first order differential equations for (lambda n(l))1 to infinity and (micron n (l)) 1 to infinity. The density is deduced by integrating these equations of the spectra and substituting in the above mentioned formula. GRA

N82-18636# Dayton Univ., Ohio.
DETERMINATION CRACK TIP FIELD PARAMETERS FOR ELASTIC-PLASTIC MATERIALS VIA AN ESTIMATION SCHEME Interim Report, Nov. 1979 - Nov. 1980
T. Weerasooriya and J. P. Gallagher Wright-Patterson AFB, Ohio AFWAL Jul. 1981 82 p refs
(Contract F33615-78-C-5184; AF Proj. 2418)
(AD-A108267; UDR-TR-80-132; AFWAL-TR-81-4044) Avail: NTIS HC A05/MF A01 CSCL 11/9

This report reviews the theoretical basis of an estimation scheme which appeared in the literature. A computer program was written for estimating the elastic-plastic fracture mechanics parameters for five different crack geometries. The parameters evaluated are J-integral, load-line displacement, and crack mouth opening displacement. Included in the report are the program listing and an example of an input and output. Author (GRA)

N82-18637# Atomic Energy of Canada Ltd., Chalk River (Ontario). Metallurgical Engineering Branch.
DEMONSTRATION OF CRACK GROWTH BY DELAYED HYDROGEN CRACKING IN THE ROLLED JOINTS OF Zr-2.5% Nb PRESSURE TUBES
C. E. Ells and J. H. vanderKuur Mar. 1980 26 p refs In ENGLISH; FRENCH summary
(AECL-6853) Avail: NTIS (US sales only) HC A03/MF A01

Delayed hydrogen cracking in cold-worked Zr-2.5 wt% Nb pressure tubes was examined in rolled-joint assemblies in tests closely simulating the power reactor conditions. The experiments were designed to demonstrate that the tube failures in Pickering were due to delayed hydrogen cracking. Most features of the failures in Pickering were reproduced, and the growth of artificial defects occurred at stress intensity factors and crack velocities quite consistent with both laboratory experiments on small specimens and the experience at Pickering. DOE

N82-18638# Atomic Energy of Canada Ltd., Chalk River (Ontario). Nuclear Lab.
ELASTIC STRESSES IN U-SHAPED BELLOWS
P. Janzen May 1980 48 p refs
(AECL-6476) Avail: NTIS (US Sales Only)HC A03/MF A01; DOE Depository Libraries

Relations describing the meridional and circumferential elastic stress levels at the root and crown due to external pressure and axial deflection of U-shaped bellows are presented. The derivation is based on a statistical analysis of theoretical data obtained from a finite element analysis of selected bellows configurations. The mathematical formulations and various graphical representations are proposed as aids to bellows design and analysis. DOE

N82-18639# Atomic Energy of Canada Ltd., Chalk River (Ontario).
X-RAY MEASUREMENT OF RESIDUAL STRESS IN METALS AT CHALK RIVER NUCLEAR LABORATORIES
J. E. Winegar Jun. 1980 28 p refs
(AECL-6961) Avail: NTIS (US Sales Only)HC A03/MF A01; DOE Depository Libraries

X-ray diffraction was used at CRNL to measure residual stress in metals. The basic principles of stress measurement and factors affecting accuracy of measurement are reviewed. The technique and equipment described were developed at CRNL to give reliable measurements. Accuracy of measurement is achieved by using fixed-count step-scanning and by computer analysis of intensity data using a cubic spline curve smoothing routine. Specific reference is made to the measurement of residual stress in Inconel-600 and Incoloy-800 boiler tubing. Because it measures stress in thin surface layers, the X-ray method can also be used to measure the depth profile of stresses. As there are no standardized procedures for measuring residual stress, this report will be useful both to those unfamiliar with the measurement of residual stress and to those already making such measurements in other laboratories. DOE

N82-18640# Centre National d'Etudes Spatiales, Toulouse (France). Dept. Structures.
METHODOLOGY OF UNIAXIAL TRANSIENT VIBRATION TEST FOR SATELLITES Final Report
B. Boissin, A. Girard, and J.-F. Imbert Paris ESA 10 Jun. 1981 20 p refs
(Contract ESTEC-4160/79/NL-AK)
(CNES-81/CT/PRT/SST/SM/194; ESA-CR(P)-1474) Avail: NTIS HC A02/MF A01

Realistic data for thrust transient, launch vehicle, and satellite characteristics are defined. Dynamic response analysis is performed based on a survey of current methods. For most of the low frequency dynamic flight environment of a satellite, transient testing minimizes the risk of under or overtesting inherent to conventional sine testing. As feasibility of such tests on uniaxial electrodynamic shakers was recently proved, the problem is now the dependance of the test specification on possible variations of launch vehicle and satellite dynamic characteristics. Possible variations of parameters are discussed and a sensitivity analysis is performed. It is found that frequency variations have the greatest influence and must be considered simultaneously. A numerical procedure is developed to compute a worst shock spectrum envelope. Alternatives for transient testing are recommended, including an improved shock synthesis technique, compared to sine testing. Author (ESA)

N82-18641# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
INVESTIGATION OF THE STRENGTH OF GALVANIC DEPOSITS
W. Wittich, K. Butter, and R. Suchentrunk 1981 8 p refs In GERMAN
(MBB-BB-487-O) Avail: NTIS HC A02/MF A01

The development of the basic condition for galvanoplastic production of different kinds of highly refractory material combinations is discussed. Structural members with extremely high thermodynamic and static loading capacity are finished from partially unconventional combinations of materials. Special finishing techniques were developed which can applied to aerospace technology. Transl. by E.A.K.

N82-18642# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Retriebsbereich.
BOND STRENGTH OF GALVANIC COATINGS UNDER

THERMAL STRESS FROM THE EXAMPLE OF GALVANIC FORMING [HAFTFESTIGKEIT GALVANISCHER UEBERZUEGE UNTER THERMISCHER BELASTUNG AM BEISPIEL DER GALVANOFORMUNG]

O. Tuscher and R. Suchentrunk 1981 11 p refs Reprint from Galvanotech., v. 8, no. 69, 1978 In GERMAN
(MBB-BB-488-O) Avail: NTIS HC A02/MF A01

The application of galvanic coating in the production of compacting systems for base metals is discussed. Production for manufacturing of galvanic metal compacting systems are described. The characteristics of galvanic coating are intermitently partially very high in loading through, pull, pressure, or shearing stress. Uses for this coating technique are described. The work is applied to basic research in different projects in aerospace sciences and energy technology. Transl. by E.A.K.

N82-18643# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Geschaeftsbereich Datenverarbeitung und Organisation.

NASEDIT: THE INTERACTIVE NASTRON EDITOR

Brunner 4 Jun. 1981 50 p Presented at NASTRAN Users' Conf., 3-4 Jun. 1981
(MBB-Z-2-81-O) Avail: NTIS HC A03/MF A01

An interpreting and finite element mesh creating program was developed. The program generates a plot and helps the user make his input small and transparent, allows modifications to any part of the input of NASTRAN, and has a structure similar to NASTRAN. This program, NASEDIT, is described. This is, what NASEDIT does. J.M.S.

N82-18644# Centre Technique des Industries Mecaniques, Senlis (France).

RESPONSE OF A STRUCTURE SOLICITED BY DISPLACEMENTS IMPOSED ON A PART OF ITS EDGE Final Report [REPONSE D'UNE STRUCTURE EXCITEE PAR DES DEPLACEMENTS IMPOSE SUR UNE PARTIE DE SA FRONTIERE]

C. Seon Jun. 1981 60 p In FRENCH
(CETIM-11-L-182) Avail: NTIS HC A04/MF A01

A computation method is presented which allows for the introduction of nonstationary displacements in the calculation of modal response. The method is adapted to the existing structural analysis computer programs PASD and BASMOD. Calculation simulations for an undamped beam were run. Results are satisfactory and a user manual for the program is given.
Author (ESA)

N82-18645# Chalmers Univ. of Technology, Goteborg (Sweden). Inst. foer Byggnadsstatik.

NONLINEAR ELASTIC BEAMS, FRAMES AND STRUCTURAL ANALYSIS [OLINJAERT ELASTISKA BALKAR OCH RAMAR MED ANALYTISKT BESKRIVNA ELEMENTSAMBAND]

Kjell Mattiasson and Lennart Aagaardh 1 Apr. 1978 60 p refs In SWEDISH
(CTH-R-31/1979; ISBN-91-540-2983-X) Avail: NTIS HC A04/MF A01

A rapid calculation method for beams and frames undergoing large deformations, when the relations between force and deformation are nonlinear, but reversible, is discussed. A computer program is described. The use of this method, based on nonlinear beam theory, is subject to the hypotheses: (1) displacements and instability factors, such as buckling, are not accounted for, and (2) the structure is considered to be flat and made of elements assembled together in nodes where the deformations are measured. The method is compared with numerical techniques. The method can be used for the calculation of beams, frames and arches made of steel, aluminum alloys and other strain-hardened materials. Author (ESA)

N82-18646# Illinois Univ. at Urbana-Champaign. Dept. of Engineering.

RESPONSE OF REINFORCED CONCRETE PLATE-COLUMN CONNECTIONS TO DYNAMIC AND STATIC HORIZONTAL LOADS. APPENDICES E TO H

Denby G. Morrison and Mete A. Sozen Apr. 1981 330 p refs
(Grant NSF PFR-78-16318)
(PB82-101544; Structural-Res-Ser-490-App-E-H; UILU-ENG-8-1-2004-App-E-H; NSF/CEE-81025) Avail: NTIS HC A15/MF A01 CSCL 13B

The response of interior reinforced concrete plate column connections was studied. Variables included reinforcement ratio and the amount of superimposed vertical load. The eight specimens had certain common characteristics. The reinforcement layout in the slab was isotropic. Static tests provide information on the influence of the change in reinforcement ratio and the amount of superimposed vertical load on the response to horizontal loading. An analysis model (the grid model) was developed to interpret the results from the statically tested specimens. The specimens are dynamic tests to obtain data on the response of the specimens, the observed hysteresis, and calculated damping. GRA

N82-18647# Dynamics Technology, Inc., Torrance, Calif.

EARTHQUAKE RESPONSE OF SEA-BASED STORAGE TANKS BY A HYBRID ELEMENT METHOD-THEORY AND COMPUTER ANALYSIS

Shih-Chi Lee and D. R. Ko Mar. 1981 214 p refs
(Grants NSF PFR-78-09886; NSF PFR-79-19949)
(PB82-104993; DT-7814-2; NSF/CEE-81026) Avail: NTIS HC A10/MF A01 CSCL 13J

An effective method for the linear analysis of dynamic response of submerged underwater oil storage tanks to loadings of earthquake excitations is presented. The tank is axisymmetric in shape and has a flexible wall/roof. A general hybrid-finite element solution procedure was formulated. Contribution from the hydrodynamic interaction to the coupled motion is obtained by solving the Laplace equation with the appropriate boundary conditions, which includes a match to the exterior farfield pressure representation to simplify the computational process. The effects of fluids surrounding and inside the tank are studied. It is demonstrated that these effects are significant to the tank earthquake response analysis. GRA

N82-18648# Queensland Univ., Brisbane (Australia). Dept. of Civil Engineering.

INELASTIC BEAM BUCKLING EXPERIMENTS

P. F. Dux and S. Kitipornchai May 1981 44 p refs
(PB82-103292; RR-CE24) Avail: NTIS HC A03/MF A01 CSCL 20K

A series of experiments on the buckling of simply supported laterally continuous I beams in the inelastic range are described. Nine beams were tested in three groups of three, each group having a different predominant moment gradient. Points of load application were prevented from moving laterally and twisting. Measurements of geometrical and material imperfections are included in the report. Results of a number of subsidiary experiments such as plastic moment and stub column tests are also presented. The results add to the small amount of test data presently available on such beams and provide a comparison with theoretical predictions. In particular, support is shown for the theoretical curves of Nethercot and Trahair and for the current trend to multiple design curves based on moment gradient. GRA

N82-18649# Sydney Univ. (Australia). Civil Engineering Labs.

LOWER BOUND EQUILIBRIUM DESIGN OF SLABS

Reginald G. Smith and M. I. Struct Jan. 1981 46 p refs
(PB82-105263; R-383) Avail: NTIS HC A03/MF A01 CSCL 20K

Collapse moment fields are computed using a 'zero-torsion' orthogonal elastic beam grillage with a flexibility approach. The method is extended to enable slabs of nonuniform thickness and the influence of attached walls and columns to be taken into account. This is achieved by using a stiffness method to evaluate the flexibility coefficients for a beam strip with rotational and linear spring constraints. The simultaneous equations for the patch loading distribution are easily composed by a matrix algorithm and the original difficulty of 'free edges' is catered for by the concept of hypothetical vertical springs of small stiffness. GRA

N82-18650# Sydney Univ. (Australia). Civil Engineering Labs.

DISTORTIONAL BUCKLING OF THIN-WEB BEAM COLUMNS

Mark A. Bradford and Nicholas S. Trahair Nov. 1980 60 p refs
(PB82-105271; R-380) Avail: NTIS HC A04/MF A01 CSCL 20K

An approximate finite element method of analysis is developed for the distortional buckling of beam columns of general cross section. The member consists of a flexible web, to which is connected two rigid flange assemblies of arbitrary shape which remain undistorted during buckling. The method permits an economic computer analysis to be made of elastic distortional buckling of members under various conditions of loading, end support and restraint. The method is also used to demonstrate the effects of web distortion on the elastic buckling of lipped channel beams under moment gradient. GRA

N82-18651# Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
DYNAMIC STRUCTURAL ANALYSIS BY ANALOG SIMULATION M.S. Thesis
Leonard M. Napolitano, Jr. Jun. 1981 100 p refs
(PB82-110677; R81-18) Avail: NTIS HC A05/MF A01 CSCL 20K

The derivation of a topologically equivalent electrical analog for a given structure is presented and its use in the analysis of structural dynamics is explored. Starting from simple structural and electrical elements, the models become more complex with the simulation of material and geometric nonlinearities. Two- and three-dimensional truss elements as well as an elemental beam model are developed. The modeling of structural damping and the construction of analogous tuned mass dampers for experimental simulation testing are presented. A trial simulation was run using a newly developed analog computer called a Parity Simulator with excellent results. The advantages of real time simulation as compared to time step digital computerbased simulation as well as future developments in real time simulation are discussed. GRA

N82-18149# Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
THE MEASUREMENT OF THE MOBILITY OF STRUCTURES AT ACOUSTIC FREQUENCIES
Susan M. Damms *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 21 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

42 GEOSCIENCES (GENERAL)

N82-18652*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF UV PROTECTION REQUIREMENTS AND TESTING OF CANDIDATE ATTENUATORS FOR THE HALOE OPTICAL INSTRUMENT
John E. Nealy, William K. Goad, and D. Michele Heath Dec. 1981 29 p refs
(NASA-TM-83247) Avail: NTIS HC A03/MF A01 CSCL 14B

Results of calculations are presented which simulate photolytic processes occurring in HALOE gas calibration cells exposed to extra-terrestrial solar ultraviolet photons. These calculations indicate that significant photolysis takes place in two of the sapphire-enclosed cells over the exposure periods of the proposed mission. A subsequent laboratory investigation is also described in which a high-voltage discharge hydrogen light source is used in conjunction with a vacuum ultraviolet spectrograph. The UV emission from this lamp was used to expose two candidate UV attenuators (ZnSe and coated Ge) to ascertain their suitability as UV filters while maintaining original infrared optical properties. Both materials were found to be effectively opaque to vacuum UV radiaton and suffered no adverse effects regarding their infrared transmissivity. Author

N82-18653# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE CENTRATLAN AEROGEOPHYSICAL OPERATION IN THE REGION OF THE MID-ATLANTIC RIDGE. INPE PARTICIPATION [OPERACAO CENTRATLAN-AEROGEOFISICA DA REGIA DA CORDILHEIRA MESO-ATLANTICA. PARTICIPACAO DO INPE]
Jose Marques daCosta and Carlos Alberto Steffen Jun. 1981 19 p In PORTUGUESE; ENGLISH summary
(INPE-2142-RPE/364) Avail: NTIS HC A02/MF A01

Brazilian participation in Operation CENTRALAN, a scientific cooperative effort, is presented. The objective of CENTRALAN is to study the physiographical, geological, and geographical aspects of the Mid-Atlantic Ridge. Author

N82-18654# Scripps Institution of Oceanography, La Jolla, Calif.
OCEANOGRAPHIC AND METEOROLOGICAL CONDITIONS IN THE NORTH PACIFIC Technical Report, Jun. - Nov. 1978
S. Pazan and J. Bytof Dec. 1981 60 p refs
(Contract N00014-80-C-0440)
(AD-A108754; SIO-REF-81-39) Avail: NTIS HC A04/MF A01 CSCL 04/2

Since 1976, four reports on oceanographic and meteorological conditions in the North Pacific have been produced by the NORPAX Data Program covering the period from June, 1976 through May, 1978. This is the fifth in the series, and covers the period from June, 1978 through November, 1978. This issue contains: contour maps of monthly meaned Fleet Numerical Oceanographic Central (FNOC) air temperature, sea temperature, wind speed, wind direction, surface vapor pressure, and 700 mb height; NORPAX Data Management calculated wind stress, wind stress curl, wind shear velocity cubed, sensible heat flux, latent heat flux; and objectively analyzed TRANSPAC (Trans Pacific) temperatures at discrete depths. GRA

N82-18655# Lamont-Doherty Geological Observatory, Palisades, N. Y.
INTERPRETATION OF EQUATORIAL HYDROGRAPHIC, NUTRIENT ELEMENT AND RADIOISOTOPE DATA Final Report
W. S. Broecker Feb. 1981 8 p
(Contract DE-AS02-79EV-10243)
(DE82-001699; DOE/EV-10243/1) Avail: NTIS HC A02/MF A01

A year-long study of the sigma CO2, alkalinity, nutrient element, and CO2 partial pressure relationships along the 150 deg W longitude from Tahiti to Hawaii is reported. The objective is to improve the understanding of the CO2 flux from the equatorial Pacific to the atmosphere. Detailed spatial and annual pictures of the distribution of the measured chemical species are expected. T.M.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-18656 Old Dominion Univ., Norfolk, Va.
USAGE AND LIMITATIONS OF CHARACTERISTIC VECTOR ANALYSIS OF REMOTE SENSING MULTISPECTRAL DATA FOR THE IDENTIFICATION AND QUANTIFICATION OF WATER QUALITY PARAMETERS Ph.D. Thesis
Theodore A. Talay 1981 394 p
Avail: Univ. Microfilms Order No. 8128308

Characteristic vector analysis is investigated to determine how it resolves total radiance signals measured by a remote sensor into eigenvectors and associated scalar coefficients and their relationships to the identification and quantification of the in situ water constituents. Technique operation is checked against a progression of hypothetical test cases and a limited number of laboratory data sets. Under ideal conditions, characteristic vector analysis has the potential of identifying and quantifying individual constituents in water, even when in mixtures, with a minimum of surface truth data. Exact constituent identification, using characteristic vectors, and quantification, by scaling a scalar

coefficients, is possible when the study constituents have a linear radiance concentration relationship, superimpose linearly in mixtures, and the measured radiance spectra are devoid of noise and atmospheric effects. As these conditions are relaxed, technique limitations and inexact solutions are encountered. Dissert. Abstr.

N82-18657 Royal Aircraft Establishment, Farnborough (England). Space Dept.

AUTOMATIC RELOCATION OF GROUND CONTROL POINTS IN LANDSAT IMAGERY

A. H. Benny 5 Jun. 1981 37 p refs

(RAE-TR-81071; RAE-Space-598; BR80598) Copyright. Avail: Issuing Activity

A computer program which relocates ground control points (GCP), used in the geometric transformation of satellite pictures is discussed. The GCP's are first located manually on the image and a map. A transformation matrix enables image locations to be converted to map references. For subsequent images, the identity of a first GCP and an indication (not necessarily precise) of its position in the new image enable a spiral search to locate that GCP and then all the others. Accuracy of + or - 0.4 pixel is obtained for LANDSAT pictures. For similar seasons, proportion relocated approaches 100%. In worst cases (6 months difference between images, with snow in the second) 60% is achieved. Author (ESA)

N82-18658*# Foster-Miller Associates, Inc., Waltham, Mass.

AUTOMATED LONGWALL GUIDANCE AND CONTROL VERTICAL CONTROL SUBSYSTEM, VOLUME 1 Final Report

W. Ronald Griffiths, Martin Smirlock, James Aplin, Roger B. Fish, and David Fish 31 Jan. 1982 161 p 2 Vol.

(Contract NAS8-33591)

(NASA-CR-161969; NAS7946-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 08I

A design, fabrication, and implementation of a horizon control of a longwall shearer was performed. This equipment was tested and demonstrated aboveground. This hardware was also installed on a longwall face. The feasibility of providing horizon control for a shearer was demonstrated aboveground. The feasibility of retrofitting the necessary sensors in a survivable manner was demonstrated underground. Subsequent field tests of a specific component, the natural background sensor, at a western location demonstrated the particular usefulness of this device on a wider application basis. Author

N82-18659*# Foster-Miller Associates, Inc., Waltham, Mass.

AUTOMATED LONGWALL GUIDANCE AND CONTROL VERTICAL CONTROL SUBSYSTEM, VOLUME 2 Final Report

W. Ronald Griffiths, Martin Smirlock, James Aplin, Roger B. Fish, and David Fish 31 Jan. 1982 404 p 2 Vol.

(Contract NAS8-33591)

(NASA-CR-161970; NAS7946-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 08I

Software documentation and a computer program listing for a horizon control of a longwall shearer are presented. N.W.

N82-18660*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SEASAT DATA UTILIZATION PROJECT Final Report

G. H. Born, D. N. Held, D. B. Lame, R. G. Lipes, D. R. Montgomery, P. J. Rygh, and J. F. Scott 30 Sep. 1981 62 p refs

(NASA-CR-168557; Rept-622-233) Avail: NTIS HC A04/MF A01 CSCL 05B

During the three months of orbital operations, the satellite returned data from the world's oceans. Dozens of tropical storms, hurricanes and typhoons were observed, and two planned major intensive surface truth experiments were conducted. The utility of the Seasat-A microwave sensors as oceanographic tools was determined. Sensor and geophysical evaluations are discussed, including surface observations, and evaluation summaries of an altimeter, a scatterometer, a scanning multichannel microwave radiometer, a synthetic aperture radar, and a visible and infrared radiometer. N.W.

N82-18661# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

REGRESSION TYPE MATHEMATICAL MODELS OF THE INTERACTION OF METEOROLOGY AND AGRICULTURAL PRODUCTIVITY. OBJECTIVES, USES AND OPERATIONAL PROBLEMS [MODELOSMATEMATICOS DAS INTERACOES VARIAVEIS METEOROLOGICAS/PRODUTIVIDADE AGRICOLA - OBJETIVOS, USOS E PROBLEMAS OPERACIONALS]

Fausto Carlos deAlmeida Jun. 1981 6 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Brazilian Cong. on Agrometeorology, Pelotas, Rio Grande do Sul, Brazil, 5-10 Jul. 1981

(INPE-2117-RPE/341) Avail: NTIS HC A02/MF A01

Mathematical models of the interactions of meteorological variables and agricultural productivity are reviewed. The ideas contained in each model are illustrated. The results of using the model and problems of use in relation to the applicability of the models for developing an objective system for forecasting harvests are considered. J.D.H.

N82-18662# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A MODEL FOR ESTIMATING THE PRODUCTIVITY OF CORN IN THE STATES OF SAO PAULO [UM MODELO PARA ESTIMAR A PRODUCTIVIDADEE DO MILHO NO ESTADO DE SAO PAULO]

Walter Celaschi and Fausto Carlos deAlmeida Jun. 1981 6 p refs In PORTUGUESE; ENGLISH summary Presented at the Brazilian Congr. on Agrometeorol. Pelotas, Rio Grande do Sul, Brazil, 5-10 Jul. 1981

(INPE-2118-RPE/342) Avail: NTIS HC A02/MF A01

A comparison of regression type crop-yield models for corn in the state of Sao Paulo, Brazil is presented. Technology trends up to the 3rd power and daily climatic variables grouped in monthly intervals and crop-dependent critically evaluated intervals are considered. A model using the cubic technology trend and the resultants weighted means in the critical intervals (defined at the 1% level) showed the best result R2 = 0.925 and sigma = 122 kg/Ha. Author

N82-18663*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SPECTRAL ALBEDOS OF MIDLATITUDE SNOWPACKS

Bhaskar Choudhury Nov. 1981 41 p refs Submitted for publication

(NASA-TM-83858) Avail: NTIS HC A03/MF A01 CSCL 08L

Spectral albedos of impure-nonhomogeneous snowpacks, typical of midlatitudes, from 400 to 2200 nm were modeled through a numerical solution of the radiative transfer equation in the two-stream approximation. Discrete depth-dependent values of density, grain size and impurity concentration were used to characterize the snowpacks. The model is for diffuse incident radiation, and the numerical method is based on doubling and invariant imbedding. The effect of soot impurities on snowpack albedos is illustrated when a snowpack is several centimeters deep and soot reduces the albedos at visible wavelengths, however, when a snowpack is only a few centimeters deep, soot may increase the albedos at visible wavelengths. By adjusting soot content and snow grain size, good quantitative agreement with some observations at the Cascade Mountains (Washington) and at Point Barrow (Alaska) are obtained; however, the model grain sizes are found to be fifty to four hundred percent larger than the measured values. For satellite snowcover observations, a model for effective albedo of partially snow-covered areas was developed and compared with some NOAA-2 observations of the southeastern United States. T.M.

N82-18664*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GROUND-TRUTH OBSERVATIONS OF ICE-COVERED NORTH SLOPE LAKES IMAGED BY RADAR

W. F. Weeks Oct. 1981 24 p refs Prepared in cooperation with CRREL, Hanover, N.H.

(NASA-TM-84127; AD-A108342; CRREL-81-19) Avail: NTIS HC A02/MF A01 CSCL 08/8

Field observations support the interpretation that differences in the strength of radar returns from the ice covers of lakes on the North Slope of Alaska can be used to determine where the

lake is frozen completely to the bottom. An ice/frozen soil interface is indicated by a weak return and an ice/water interface by a strong return. The immediate value of this result is that SLAR (side-looking airborne radar) imagery can now be used to prepare maps of large areas of the North Slope showing where the lakes are shallower or deeper than 1.7m (the approximate draft of the lake ice at the time of the SLAR flights). The bathymetry of these shallow lakes is largely unknown and is not obvious from their sizes or outlines. Such information could be very useful, for example in finding suitable year-round water supplies.
Author (GRA)

N82-18665# Defense Mapping Agency, Washington, D.C. ADP Production Programs Div.
DEFENSE MAPPING AGENCY DIGITAL DATA BASE EVOLUTION
Francis M. Mirkay Nov. 1981 20 p
(AD-A108327) Avail: NTIS HC A02/MF A01 CSCL 08/2

The Defense Mapping Agency (DMA) has massive amounts of MC&G digital data holdings resulting from programs to support DoD advanced weapons systems and automated map and chart production. The digital data is used to support the DoD and NATO countries as well as internal DMA production. DMA requires a digital data base to maintain, store, retrieve, compare, and report on this MC&G digital data. This paper addresses current DMA efforts that will evolve into an on line interactive, distributed, networked data base system and its associated environment for data handled by HQ DMA and the DMA Production Centers.
Author (GRA)

N82-18666# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Cartographic Data Div.
ICFITG: A PROGRAM FOR INTERACTIVE CONTOURING FROM AN IRREGULAR TRIANGULAR GRID
Robert F. Brown and Harold Moellering (Ohio State Univ.) Dec. 1981 17 p refs
(AD-A108515) Avail: NTIS HC A02/MF A01 CSCL 08/2

The computer program Interactive Contouring from an Irregular Triangular Grid (ICFITG) allows the program user to make judgements during the preparation or modification of an isarithmic map. This is accomplished interactively through the use of virtual images and devices, character commands and responses, and audio signals such that the cartographer can make decisions that affect the outcome of the final map while the program is executing. It is interactive computer graphics that form the link between the speed and repetitive processing power of the computer and the decision making power of the cartographer. The computer program ICFITG incorporates a contouring algorithm which is based on the formation of an irregular triangular grid. The use of such an algorithm ensures that the original control points lie on the surface and allows provisions to be included that give respect to surface characteristics such as breaklines. Based on research conducted at the Ohio State University, the combination of an irregular triangular grid contouring algorithm and interactive computer graphics results in a fast, flexible and easy to use computer contouring program.
Author (GRA)

N82-18667# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
AUTOMATED SLOPE GENERATION USING RASTER TECHNOLOGY
Michael P. Lee Dec. 1981 12 p refs
(AD-A108700) Avail: NTIS HC A02/MF A01 CSCL 08/2

The Sci-Tex Response 250 Mapping System has been in production at the Defense Mapping Agency Hydrographic/Topographic Center (DMAHTC) for the past two years. Initially acquired for foreign chart modification and color separation, this cartographic system has had a significant impact in rapid response situations. Recent gains in slope generation have further enhanced the capabilities of this automated tool. Author (GRA)

N82-18668# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
APPLICATIONS OF THE DoD WORLD GEODETIC SYSTEM: THE 1972 CHARTING BY THE USE OF A SEMIAUTOMATED SYSTEM Final Technical Report
Donald Wirak 26 Jan. 1981 13 p refs Presented at the Technol. Exchange Week, Computer Appl. Session, Balboa, Panama, Jan. 1982
(AD-A108326) Avail: NTIS HC A02/MF A01 CSCL 08/5

DMA has a semi-automated system that is used to evaluate the horizontal datum of maps and charts for geodetic accuracy. Geodetic control descriptions in the DMAHTC library of holdings are used to make this evaluation. The computer system gives geodetic shifts to source maps, surveys, and charts. The chart is compiled from a panel base with the WGS-72 shifts applied. The final color proof of the chart is evaluated and checked to see if it is on the WGS-72 datum. Several charts will be exhibited and explained from a cartographic point of view as to how they were placed on WGS-72 datum. The exhibited charts are new charts of the Panama Canal and the Pacific coast of Panama. Examples of how the program was used to improve the geodetic accuracy of the charts on the last stage of compilation will be exhibited.
Author (GRA)

N82-18669# Eurospace, Paris (France).
EXAMINATION OF THE OPERATIONAL PROSPECTS FOR REMOTE SENSING Final Report [EXAMEN DES PERSPECTIVES OPERATIONNELLES DE LA TELEDETECTION]
Eleonora Ambrosetti Paris ESA Dec. 1980 305 p refs In FRENCH
(Contract ESA-4080/79/F-FC(SC))
(ESA-CR(P)-1476) Avail: NTIS HC A14/MF A01

European remote sensing activities are reviewed while development and utilization trends are identified. Existing and planned satellite systems are described. Remote sensing applications are listed by country in the European Economic Community. Cartography, geology, agriculture, silviculture, and land and water resources management are mentioned among other user disciplines. Applications are summarized in three categories: terrestrial, maritime, and coastal. Although maritime and coastal uses of remote sensing data are less well developed than terrestrial applications, economic, social and political benefits which can be accrued by Europe are sure to provide a strong incentive to continuing development.
Author (ESA)

N82-18670# World Meteorological Organization, Geneva (Switzerland). Rapporteur on Sediment Transport.
MEASUREMENT OF RIVER SEDIMENTS
1981 69 p refs
(WMO-561; OHR-16; ISBN-92-63-10561-8) Avail: NTIS MF A01; print copy available at WMO, Geneva

Samples and remote sensing techniques for measuring sediment discharge in alluvial rivers are reviewed, noting that the simplest as well as sophisticated methods are not mutually exclusive. It is demonstrated that, in many cases, the optimum means for systematic sediment measurement is a combination of traditional and advanced methods and instruments. Areas where further improvement is needed, e.g., automation and telemetering as well as the international standardization of water pollution aspects of sediment monitoring, are indicated.
Author (ESA)

N82-18671# World Meteorological Organization, Geneva (Switzerland).
FLASH FLOOD FORECASTING
A. J. Hall 1981 49 p refs
(WMO-577; OHR-18; ISBN-92-63-10577-4) Avail: NTIS MF A01; print copy available at WMO, Geneva SwFr 6

The problem of flash floods is reviewed and basic flash flood forecasting techniques, warning systems, and non-real time solutions to flash flooding are discussed. Data sources for flash flood forecasting are identified, including radar, satellites and quantitative precipitation forecasting. Flash flood forecasting can be based on meteorological, hydrological, meteorological-hydrological or dam break techniques. The design and establishment of flash flood warning systems, ranging from simple networks and procedures to sophisticated computerized automatic systems are described. The success of a flash flood warning system is measured by public response to warnings, the saving of life, and reduction of damage to property. Community involvement is evaluated, indicating the complex interactions among agencies, information dissemination subsystems and the public. Flood plain zoning, and basin management and the construction of engineering works are considered. The limitations and advantages of flood damage reduction measures are also analyzed.
Author (ESA)

N82-18672# Research Inst. of National Defence, Linkoeping (Sweden). Huvudavdelning 3.

OBSERVATIONS WITH AN IMAGING 35 GHz RADIOMETER OF TERRAIN IN MALMSLATETT, JULY 1980

Gunnar Stenstroem and Ain Sume Oct. 1981 39 p refs Original contains color illustrations

(FOA-C-30240-E1/E3) Avail: NTIS HC A03/MF A01

Microwave emission of militarily important terrain was studied, using Dicke radiometer measurements around an air traffic control tower. The radiometer has a 60 cm parabolic Cassegrain antenna, controlled through a desk top computer, which also manages the data sampling and recording. The radiometric images were color-coded and presented on-line on a TV monitor. A selected part of the scenery was monitored once every hour in order to examine time variations of the observed antenna temperature and their correlation with day-to-night and meteorological changes. The significance of reflected, cold sky radiation in smooth surfaces (metals, plastics, roads) is demonstrated, resulting in a contrast with the less reflective surroundings. Author (ESA)

N82-18673# Geological Survey, Albany, N.Y. Water Resources Div.

USE OF FLOW-DURATION CURVES TO EVALUATE EFFECTS OF URBANIZATION ON STREAMFLOW PATTERNS ON LONG ISLAND, NEW YORK Final Water-Resources Investigations

Keith R. Prince 1981 25 p refs Prepared in cooperation with Nassau County Dept. of Public Work, N.Y. and Suffolk County Dept. of Health Services, N.Y.

(PB82-114307; USGS/WRD/WRI/81-083; USGS/WRI-80-114) Avail: NTIS HC A02/MF A01 CSCL 08H

The change of streamflow patterns on Long Island over the last three decades in response to eastward population growth and urbanization was examined. Flow duration curves for nine streams in Nassau and Suffolk Counties indicate that, during this time, streams in urbanized areas increased peak flows and decrease base flows, whereas streams in sparsely populated areas show little or no change. The increase in peak flows reflects the greater volume of storm runoff from impermeable surfaces such as roads, parking lots, and roofs. It is found that the decrease in base flows is a result of the lowering of ground water levels, principally by sanitary sewerage and extensive pumping for public water supply. GRA

N82-18674# Institute of Hydrology, Wallingford (England).

SOIL PHYSICAL PROCESSES OF GROUNDWATER RECHARGE THROUGH INDIAN BLACK COTTON SOILS

M. G. Hodnett and J. P. Bell Apr. 1981 40 p refs

(PB82-112137; Rept-77) Avail: NTIS HC A03/MF A01 CSCL 08H

Soil physical studies were carried out in the black cotton soil areas of the Betwa Basin, Central India, to assess their role in partitioning monsoon rainfall into runoff and groundwater recharge. The regional and annual variations of soil moisture were studied first, followed by studies of the soil water flow mechanisms at representative sites. The studies suggested that significant recharge is possible only in the shallow soil areas, where structured clay/silts directly overlie the weathered basalt surface aquifer. GRA

N82-18675# Geological Survey, Indianapolis, Ind. Water Resources Div.

GROUND-WATER RESOURCES OF THE WHITE RIVER BASIN, MADISON COUNTY, INDIANA Final Water-Resources Investigations

Wayne W. Lapham Jun. 1981 122 p refs Prepared in cooperation with Indiana State Dept. of Natural Resources

(PB82-109844; USGS/WRD/WRI/81-084; USGS/WRI-81-35) Avail: NTIS HC A06/MF A01 CSCL 08H

The ground-water resources of the White River basin in and near Madison County, Indiana were investigated by mapping the aquifers, estimating their hydraulic properties, determining the distribution of potentiometric head in the aquifers, and estimating some of the components of the ground-water budget from data collected in the field. This information was used to construct and calibrate a five-layer, digital ground-water flow model. The model, constructed and calibrated to ground-water level and seepage data collected during the study, simulates conditions for the autumn of 1976. The model was used to provide estimates of ground-water potential in terms of yield, drawdown, and depletion in streamflow. GRA

N82-18676# Geological Survey, Raleigh, N. C. Water Resources Div.

AN OBSERVATION-WELL NETWORK CONCEPT AS APPLIED TO NORTH CAROLINA Final Water Resource Investigation, 1977 - 1979

M. D. Winner, Jr. Mar. 1981 68 p refs Prepared in cooperation with North Carolina Dept. of Natural Resources and Community Development

(PB82-106089; USGS/WRD/WRI/81-082; USGS-WRI-81-13) Avail: NTIS HC A04/MF A01 CSCL 08H

A statewide observation well program for North Carolina based on four networks of observation wells with different objectives was proposed. These networks are referred to as (1) climatic effects network; (2) terrain effects network; (3) local effects network, and (4) area effects network. The characteristics of each network are related to natural and manmade stresses in aquifers, and the areas and hydrogeologic units in North Carolina where these networks are needed are identified. GRA

N82-18677# Association of Bay Area Governments, Berkeley, Calif.

AREAWIDE STORMWATER POLLUTION ANALYSIS WITH THE MACROSCOPIC PLANNING (ABMAC) MODEL. PART 1: DOCUMENTATION AND APPLICATION. PART 2: USER'S MANUAL Final Report, Jun. 1978 - Nov. 1980

Yoram J. Litwin, John A. Lager, and William G. Smith Sep. 1981 198 p refs

(Grant EPA-R-806357)

(PB82-107947; EPA-600/2-81-223) Avail: NTIS HC A09/MF A01 CSCL 08H

The model is intended for use by local engineers and planners, and is adaptable for mini-computer applications. The model is designed to simulate runoff caused by rainfall, storage and treatment balances and to assess the magnitude of runoff and storage withdrawals. GRA

N82-18678# Illinois Natural History Survey, Urbana.

A STRESS FUNCTION FOR EVALUATING STRATEGIES FOR WATER QUALITY MANAGEMENT Final Report, Sep. 1977 - Mar. 1980

Warren U. Brigham and Donald L. Hey (Hey, Donald L. and Associates) Sep. 1981 104 p refs

(Grant EPA-R-805614)

(PB82-109828; EPA-600/2-81-217) Avail: NTIS HC A06/MF A01 CSCL 08H

The relationship between biological communities and the physical and chemical conditions in the aquatic environment was investigated. Seasonal patterns and the duration and probability of occurrence of chemical conditions and physical events were established via computer modelling. An instantaneous measure of stress was calculated by summing the decimal fractions of the 96-hr lethal concentrations (for bluegills) of each of 21 separate toxicants. Stress functions were computed for several locations in a test watershed in northeastern Illinois. GRA

N82-18679# Indiana Univ., Bloomington. School of Public and Environmental Affairs.

A LAND USE ANALYSIS OF EXISTING AND POTENTIAL COAL SURFACE MINING AREAS IN THE OHIO RIVER BASIN ENERGY STUDY REGION

Daniel E. Willard, Michael A. Ewert, Mary Ellen Hogan, and Jeffrey D. Martin Apr. 1981 136 p refs

(Contract EPA-R-805588)

(PB82-105172; EPA-600/7-81-068) Avail: NTIS HC A07/MF A01 CSCL 08I

The land use changes resulting from the surface mining of coal in the Ohio River Basin, which depend on the distribution of the coal, the economic attractiveness of the coal demand, rigor and effectiveness of regulatory mechanisms, and the resilience of the existing ecosystems are reported. The three levels of coal demand assumed are taken from ORBES scenarios.

The study analyzes existing industrial and governmental data on distribution, availability, and extraction of strippable coal. The history of reclamation enforcement and compliance is examined, and several potential land use results of the Federal Surface Mining Control and Reclamation Act of 1977 are analyzed. All of these factors are compared to existing patterns of topography, agriculture, and forestry. GRA

N82-18680# Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.
COAL MINE SITING FOR THE OHIO RIVER BASIN ENERGY STUDY
Donald A. Blome Sep. 1981 180 p refs
(Grant EPA-R-805590)
(PB82-108119; EPA-600/7-81-116) Avail: NTIS HC A09/MF A01 CSCL 08I

In part 1, an overview of the ORBES region coal industry is presented. (The region consists of all of Kentucky, most of West Virginia, and substantial portions of Illinois, Indiana, Ohio, and Pennsylvania). Topics include coal production, mine types, reserves, selected coal properties, coal markets, employment, working conditions, wages, and quality of life. In part 2, the procedures for siting coal mines under the ORBES energy development scenarios are set forth. The coal mine siting analysis projects at the county level the number and type of new coal mines that would be opened in the ORBES region through the year 2000 under various scenario conditions and constraints. Among these conditions and constraints are the locational siting pattern of additional power plants in each scenario, the total coal production specified for the year 2000 by the ORBES energy demand model, and the sources of high and low sulfur coal, by mine type, specified by the ORBES coal supply analysis. GRA

N82-18681# Geological Survey, Menlo Park, Calif.
WATER RESOURCES DATA FOR CALIFORNIA. VOLUME 3: SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER Annual Report, 1 Oct. 1979 - 30 Sep. 1980
Sep. 1981 445 p Prepared in cooperation with California Dept. of Water Resources
(PB82-117003; USGS/WRD/HD-81/077) Avail: NTIS HC A19/MF A01 CSCL 08H

Water resources data for the 1980 water year for California consists of records of stage, discharge, gage height, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; water levels and water quality of wells. This report contains discharge records for 185 gaging stations; stage and contents for 39 lakes and reservoirs; gage height records for 2 lakes; water quality for 62 stations; water levels for 56 observation wells. Eleven crest stage partial record stations and one water quality partial record stations are included. GRA

N82-18682# Geological Survey, Charleston, W. Va. Water Resources Div.
WATER RESOURCES DATA FOR WEST VIRGINIA, WATER YEAR 1980 Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Jul. 1981 484 p refs
(PB82-111634; USGS/WRD/HD-80/072; USGS-WDR-WV-80-1) Avail: NTIS HC A21/MF A01 CSCL 08H

Tables show stage, discharge, and water quality of streams and springs; stage and contents of lakes and reservoirs; and water levels in wells. Discharge records for 117 gaging stations; stage only records for 8 gaging stations; stage and contents for 8 lakes and reservoirs; contents for 1 reservoir; change in contents for 1 reservoir; water quality for 101 gaging stations; and water levels for 37 observation wells are presented. Five crest stage partial-record stations, and 1 low-flow partial record station are included along with additional water data collected at various sites, not part of the systematic data collections program. GRA

N82-18683# Geological Survey, Menlo Park, Calif. Water Resource Div.
WATER RESOURCES DATA FOR CALIFORNIA. VOLUME 1: COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Edward J. Jones, Verrie F. Pearce, Jay R. Foulk, James R. Mullen, Wallace F. Shelton, and Linda R. Zeitz Aug. 1981 473 p refs Prepared in cooperation with California State Dept. of Water Resources 4 Vol.
(PB82-116997; USGS/WRD/HD-81/075; USGS-WDR-CA-80-1) Avail: NTIS HC A20/MF A01

Water resources data for the 1980 water year for California presented consist of (1) discharge records for 174 gaging stations; (2) stage and contents for 18 lakes and reservoirs; (3) water quality for 51 stations; and (4) water levels for 165 observations wells. GRA

N82-18684# Geological Survey, Menlo Park, Calif. Water Resources Div.
WATER RESOURCES DATA FOR CALIFORNIA. VOLUME 4: NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE Annual Water-Data Report, 1 Oct. 1979 - 30 Sep. 1980
Kay L. Spiegl, Julia A. Schulenburg, Nancy A. Gilligan, Lisa A. Redmond, Barbara J. Symonds, Dorothy E. Maltby, and Karen Downing Sep. 1981 468 p refs Prepared in cooperation with California State Dept. of Water Resources 4 Vol.
(PB82-117011; USGS/WRD/HD-81/078) Avail: NTIS HC A20/MF A01 CSCL 08H

Discharge records for 199 gaging stations; stage and contents for 34 lakes and reservoirs; precipitation data for stations; water quality for stations; water levels for 54 observation wells, and water quality data for 26 wells are presented along 16 crest-stage partial record stations and 7 low flow partial record stations. GRA

N82-18685# Pennsylvania State Univ., University Park. Dept. of Mineral Engineering.
CABLES FOR FACE EQUIPMENT STANDARDIZATION OF REQUIREMENTS Final Open File Report, 1 Aug. 1977 - 1 Apr. 1981
R. Stefanko, C. Bise, G. Luxbacher, and K. Katen 1 Jun. 1981 49 p refs
(Contract DI-BM-H0-377043)
(PB82-113820; BM-OFR-135-81) Avail: NTIS HC A03/MF A01 CSCL 08I

Cable protection, circuit breakers, and high voltage cable couplers are discussed. Laboratory and analytical studies were conducted in the three areas to determine proper circuit breaker settings, cable sizes, and coupler performance. Also, an extensive field monitoring program was established to relate in-mine experience to laboratory findings. Further, various pieces of equipment were designed for laboratory testing, particularly in the area of cable reeling and unreeling. GRA

N82-18240*# European Space Conference, Paris (France).
MICROWAVE REMOTE SENSING EXPERIMENT
G. Dieterle *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 14B

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-18686* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR ENERGY CONTROL SYSTEM Patent

James R. Currie, inventor (to NASA) Issued 8 Dec. 1981 9 p Filed 20 Nov. 1979 Supersedes N80-17544 (18 - 08, p 1023)
(NASA-Case-MFS-25287-1; US-Patent-4,304,219; US-Patent-Appl-SN-098570; US-Patent-Class-126-422; US-Patent-Class-126-429; US-Patent-Class-126-430) Avail: US Patent and Trademark Office CSCL 10A

A solar energy control system for a hot air type solar energy heating system wherein thermocouples are arranged to sense the temperature of a solar collector, a space to be heated, and a top and bottom of a heat storage unit is disclosed. Pertinent thermocouples are differentially connected together, and these are employed to effect the operation of dampers, a fan, and an auxiliary heat source. In accomplishing this, the differential outputs from the thermocouples are amplified by a single amplifier by multiplexing techniques. Additionally, the amplifier is corrected as to offset by including as one multiplex channel a common reference signal.

Official Gazette of the U.S. Patent and Trademark Office

N82-18687* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 31
Oct. 1981 356 p
(NASA-SP-7043(31)) Avail: NTIS HC A16/MF A01 CSCL 10B

This bibliography lists 1111 reports, articles, and other documents introduced into the NASA scientific and technical information system from July 1, 1981 through September 30, 1981. T.M.

N82-18688*# Gilbert/Commonwealth, Reading, Pa.
MAGNETOHYDRODYNAMICS (MHD) ENGINEERING TEST FACILITY (ETF) 200 MWe POWER PLANT. CONCEPTUAL DESIGN ENGINEERING REPORT (CDER). VOLUME 4: SUPPLEMENTARY ENGINEERING DATA
Sep. 1981 548 p refs
(Contract DEN3-224; DE-AI01-77ET-10769)
(NASA-CR-165452-Vol-4; DOE/NASA/0224-1-Vol-4) Avail: NTIS HC A23/MF A01 CSCL 10B

The reference conceptual design of the Magnetohydrodynamic Engineering Test Facility (ETF), a prototype 200 MWe coal-fired electric generating plant designed to demonstrate the commercial feasibility of open cycle MHD is summarized. Main elements of the design are identified and explained, and the rationale behind them is reviewed. Major systems and plant facilities are listed and discussed. Construction cost and schedule estimates, and identification of engineering issues that should be reexamined are also given. The latest (1980-1981) information from the MHD technology program are integrated with the elements of a conventional steam power electric generating plant. Supplementary Engineering Data (Issues, Background, Performance Assurance Plan, Design Details, System Design Descriptions and Related Drawings) is presented. M.D.K.

N82-18689*# Applied Solar Energy Corp., City of Industry, Calif.
DEVELOPMENT OF THIN WRAPAROUND JUNCTION SILICON SOLAR CELLS Final Report, Sep. 1980 - Nov. 1981
F. Ho and P. A. Iles Nov. 1981 43 p refs
(Contract NAS3-22228)
(NASA-CR-165570) Avail: NTIS HC A03/MF A01 CSCL 10A

The state of the art technologies was applied to fabricate 50 micro thick 2x4 cm, coplanar back contact (CBC) solar cells with AMO efficiency above 12%. A requirement was that the cells have low solar absorptance. A wraparound junction (WAJ) with wraparound metallization was chosen. This WAJ approach avoided the need for very complex fixturing, especially during rotation of the cells for providing adequate contacts over dielectric edge layers. The contact adhesion to silicon was considered better than to an insulator. It is indicated that shunt resistance caused by poor WAJ diode quality, and series resistance from the WAJ contact, give good cell performance. The cells developed reached 14 percent AMO efficiency (at 25 C), with solar absorptance values of 0.73. Space/cell environmental tests were performed on these cells and the thin CSC cells performed well. The optimized design configuration and process sequence were used to make 50 deliverable CBC cells. These cells were all above 12 percent efficiency and had an average efficiency of -13 percent. Results of environmental tests (humidity-temperature, thermal shock, and contact adherence) are also given. E.A.K.

N82-18690*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
LOW NO SUBx HEAVY FUEL COMBUSTOR CONCEPT PROGRAM. PHASE 1A: COAL GAS ADDENDUM Final Report, 29 Jun. - Oct. 1981
Thomas Rosfjord and Richard Sederquist Jan. 1982 43 p refs
(Contract DEN3-149; DE-AI01-77ET-13111)
(NASA-CR-165577; DOE/NASA/0149-2; GTR-3932) Avail: NTIS HC A03/MF A01 CSCL 10B

The performance and emissions from a rich-lean combustor fired on simulated coal gas fuels were investigated using a 12.7-cm diameter axially-staged burner originally designed for operation with high heating value liquid fuels. A simple, tubular fuel injector was substituted for the liquid fuel nozzle; no other combustor modifications were made. Four test fuels were studied including three chemically bound nitrogen-free gas mixtures with higher heating values of 88, 227, and 308 kj/mol (103, 258 and 349 Btu/scf), and a 227 kj/mol (258 Btu/scf) heating value doped with ammonia to produce a fuel nitrogen content of 0.5% (wt). Stable, ultra-low nitrogen oxide, smoke-free combustion was attained for the nitrogen-free fuels. Results with the doped fuel indicated that less than 5% conversion of NH3 to nitrogen oxide levels below Environmental Protection Agency limits could be achieved. In some instances, excessive CO levels were encountered. It is shown that use of a burner design employing a less fuel-rich primary zone than that found optimum for liquid fuels would yield more acceptable CO emissions. A.R.H.

N82-18691*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL STUDY OF AN INTEGRAL CATALYTIC COMBUSTOR: HEAT EXCHANGER FOR STIRLING ENGINES
Daniel L. Bulzan 1982 20 p refs Presented at the 1982 Intern. Congr. and Exposition, Detroit, 22-26 Feb. 1982; sponsored by SAE
(Contract DE-AI01-77CS-51040)
(NASA-TM-82783; DOE/NASA/51040-36) Avail: NTIS HC A02/MF A01 CSCL 10A

The feasibility of using catalytic combustion with heat removal for the Stirling engine to reduce exhaust emissions and also improve heat transfer to the working fluid was studied using spaced parallel plates. An internally air-cooled heat exchanger was placed between two noble metal catalytic plates. A preheated fuel-air mixture passed between the plates and reacted on the surface of the catalyzed plates. Heat was removed from the catalytic surface by radiation and convection to the aircooled heat exchangers to control temperature and minimize thermal nitrogen oxide emissions. Test conditions were inlet combustion air temperatures from 850 to 900 K, inlet velocities of about 10 m/s, equivalence ratios from 0.5 to 0.9, and pressures from 1.3x10 to the 5th power to 2.0x10 to the 5th power Pa. Propane fuel was used for all testing. Combustion efficiencies greater than 99.5 percent were measured. Nitrogen oxide emissions ranged from 1.7 to 3.3 g NO2/kg fuel. The results demonstrate the feasibility of the concept and indicate that further investigation of the concept is warranted. A.R.H.

N82-18692*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
GaAs SHALLOW-HOMOJUNCTION SOLAR CELLS Final Report
John C. C. Fan 30 Jun. 1981 52 p refs
(NASA Order C-46566-D)
(NASA-CR-165579) Avail: NTIS HC A04/MF A01 CSCL 10A

The feasibility of fabricating space resistant, high efficiency, light weight, low cost GaAs shallow homojunction solar cells for space application is investigated. The material preparation of ultrathin GaAs single crystal layers, and the fabrication of efficient GaAs solar cells on bulk GaAs substrates are discussed.

Considerable progress was made in both areas, and conversion efficiency about 16% AMO was obtained using anodic oxide as a single layer antireflection coating. A computer design shows that even better cells can be obtained with double layer antireflection coating. Ultrathin, high efficiency solar cells were obtained from GaAs films prepared by the CLEFT process, with conversion efficiency as high as 17% at AMI from a 10 micrometers thick GaAs film. A organometallic CVD was designed and constructed. B.W.

N82-18693*# Structural Composites Industries, Inc., Azusa, Calif.

DESIGN, EVALUATION, AND FABRICATION OF LOW-COST COMPOSITE BLADES FOR INTERMEDIATE-SIZE WIND TURBINES Final Report

Oscar Weingart Sep. 1981 210 p refs

(Contracts DEN3-100; DE-AI01-79ET-20320)

(NASA-CR-165342; DOE/NASA/0100-1; SCI-81520) Avail: NTIS HC A10/MF A01 CSCL 10A

Low cost approaches for production of 60 ft long glass fiber/resin composite rotor blades for the MOD-0A wind turbine were identified and evaluated. The most cost-effective configuration was selected for detailed design. Subelement and subscale specimens were fabricated for testing to confirm physical and mechanical properties of the composite blade materials, to develop and evaluate blade fabrication techniques and processes, and to confirm the structural adequacy of the root end joint. Full-scale blade tooling was constructed and a partial blade for tool and process tryout was built. Then two full scale blades were fabricated and delivered to NASA-LeRC for installation on a MOD-0A wind turbine at Clayton, New Mexico for operational testing. Each blade was 60 ft. long with 4.5 ft. chord at root end and 2575 lbs weight including metal hub adapter. The selected blade configuration was a three cell design constructed using a resin impregnated glass fiber tape winding process that allows rapid wrapping of primarily axially oriented fibers onto a tapered mandrel, with tapered wall thickness. The ring winder/transverse filament tape process combination was used for the first time on this program to produce entire rotor blade structures. This approach permitted the complete blade to be wound on stationary mandrels, an improvement which alleviated some of the tooling and process problems encountered on previous composite blade programs.

Author

N82-18694*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASSESSMENT OF STEAM-INJECTED GAS TURBINE SYSTEMS AND THEIR POTENTIAL APPLICATION

Robert J. Stochl Feb. 1982 21 p refs

(NASA-TM-82735; E-1047) Avail: NTIS HC A02/MF A01 CSCL 10B

Results were arrived at by utilizing and expanding on information presented in the literature. The results were analyzed and compared with those for simple gas turbine and combined cycles for both utility power generation and industrial cogeneration applications. The efficiency and specific power of simple gas turbine cycles can be increased as much as 30 and 50 percent, respectively, by the injection of steam into the combustor. Steam-injected gas turbines appear to be economically competitive with both simple gas turbine and combined cycles for small, clean-fuel-fired utility power generation and industrial cogeneration applications. For large powerplants with integrated coal gasifiers, the economic advantages appear to be marginal. T.M.

N82-18695*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THERMODYNAMIC LIMITS FOR SOLAR ENERGY CONVERSION BY A QUANTUM-THERMAL HYBRID SYSTEM

C. E. Byvik, A. M. Buoncristiani, and B. T. Smith Nov. 1981 20 p refs Prepared in cooperation with Christopher Newport Coll.

(NASA-TM-83229) Avail: NTIS HC A02/MF A01 CSCL 10A

The limits are presented fo air mass 1.5 conditions. A maximum conversion efficiency of 74 percent is thermodynamically achievable for the quantum device operating at 3500 K and the heat engine in contact with a reservoir at 0 K. The efficiency drops to 56 percent for a cold reservoir at approximately room temperature conditions. Hybrid system efficiencies exceed 50 percent over receiver temperatures ranging from 1400 K to 4000 K, suggesting little benefit is gained in operating the system above 1400 K. The results are applied to a system consisting of a photovoltaic solar cell in series with a heat engine. T.M.

N82-18696*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THE ULTIMATE EFFICIENCY OF PHOTOSENSITIVE SYSTEMS

A. M. Buoncristiani, C. E. Byvik, and B. T. Smith Dec. 1981 22 p refs Prepared in cooperation with Christopher Newport Coll.

(Grant NsG-1514)

(NASA-TM-83230) Avail: NTIS HC A02/MF A01 CSCL 10A

These systems have in common two important but not independent features: they can produce a storable fuel, and they are sensitive only to radiant energy with a characteristic absorption spectrum. General analyses of the conversion efficiencies were made using the operational characteristics of each particular system. An efficiency analysis of a generalized system consisting of a blackbody source, a radiant energy converter having a threshold energy and operating temperature, and a reservoir is reported. This analysis is based upon the first and second laws of thermodynamics, and leads to a determination of the limiting or ultimate efficiency for an energy conversion system having a characteristic threshold. T.M.

N82-18697*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THERMODYNAMIC LIMITS TO THE EFFICIENCY OF SOLAR ENERGY CONVERSION BY QUANTUM DEVICES

A. M. Buoncristiani, C. E. Byvik, and B. T. Smith (Christopher Newport College, Va.) Nov. 1981 14 p refs

(NASA-TM-83228) Avail: NTIS HC A02/MF A01 CSCL 10A

The second law of thermodynamics imposes a strict limitation to the energy converted from direct solar radiation to useful work by a quantum device. This limitation requires that the amount of energy converted to useful work (energy in any form other than heat) can be no greater than the change in free energy of the radiation fields. Futhermore, in any real energy conversion device, not all of this available free energy in the radiation field can be converted to work because of basic limitations inherent in the device itself. A thermodynamic analysis of solar energy conversion by a completely general prototypical quantum device is presented. This device is completely described by two parameters, its operating temperature T sub R and the energy threshold of its absorption spectrum. An expression for the maximum thermodynamic efficiency of a quantum solar converter was derived in terms of these two parameters and the incident radiation spectrum. Efficiency curves for assumed solar spectral irradiance corresponding to air mass zero and air mass 1.5 are presented. T.M.

N82-18698*# DHR, Inc., Washington, D.C.

MARKET ASSESSMENT OF PHOTOVOLTAIC POWER SYSTEMS FOR AGRICULTURAL APPLICATIONS IN NIGERIA Final Report

David Staples, Henry Steingrass, and James Nolfi (ARD, Inc., Burlington, Vt.) Oct. 1981 115 p refs

(Contracts DEN3-180; DE-AI01-79ET-20485)

(NASA-CR-165511; DOE/NASA/0180-4; C4100-50) Avail: NTIS HC A06/MF A01 CSCL 10A

The market potential for stand-alone photovoltaic systems in agriculture was studied. Information is presented on technical and economically feasible applications, and assessments of the business, government and financial climate for photovoltaic sales. It is concluded that the market for stand-alone systems will be large because of the availability of captial and the high premium placed on high reliability, low maintence power systems. Various specific applications are described, mostly related to agriculture. R.J.F.

N82-18699# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

I-V CHARACTERIZATION OF SOLAR CELLS [CARACTERIZ-

ACAO I-V DE CELULAS SOLARES]
Nelson Veissid, R. Ranvaud, and F. J. Fonseca Jun. 1981 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2141-RPE/363) Avail: NTIS HC A02/MF A01

Equivalent circuits were analysed and then I-V characteristics obtained from different solar cells were compared with those from the circuits. The measures were obtained under natural conditions and under artificial conditions (solar simulator made of easily obtained light sources and several filters). The identification of components in the equivalent circuit, together with the theory of photovoltaic conversion, is very important in the optimization of the cell design. A numeric method for determination of the series resistance is proposed. T.M.

N82-18700# Friends of the Earth, San Francisco, Calif.
ENERGY POLICIES FOR RESILIENCE AND NATIONAL SECURITY Final Report
Amory B. Lovins and L. Hunter Lovins Oct. 1981 322 p refs
(Contract DCPA01-79-C-0317)
(AD-A108263) Avail: NTIS HC A14/MF A01 CSCL 15/3

The vulnerabilities of the U.S. energy system to accidental or deliberate disruptions are analyzed generically and specifically and shown to be disturbingly large. Since they arise from reliance on highly centralized technologies, increasing such reliance is likely to increase national energy vulnerability. A more efficient, diverse, dispersed, renewable energy system is shown to be inherently more resilient, to make major failures impossible, and to be compatible with consistent adherence to free-market principles. Author (GRA)

N82-18701# Central Wayne County Sanitation Authority, Dearborn Heights, Mich.
FEASIBILITY STUDY ON ENERGY RECOVERY AND COGENERATION FROM AN EXISTING MUNICIPAL INCINERATOR, PHASE 1 Final Report
Jul. 1981 458 p refs
(Contract DE-FG01-79CS-20232)
(DE82-001143; DOE/CS-20232/1) Avail: NTIS HC A20/MF A01

A feasibility study of recovering and converting incinerator waste heat energy into steam and electricity for use in the facility with excess electricity being sold to the local utility was made. Energy recovery would be accomplished by retrofitting each furnace with a waste heat boiler and producing steam for heating and for driving steam turbine electric generators. Preliminary designs economic analyses, and financial plans were prepared. The quantity of municipal refuse was identified and the electric revenues needed for project justification were calculated. For the purpose of obtaining accurate design data, field tests were carried out on the actual refuse and combustion process. DOE

N82-18702# Exxon Research and Engineering Co., Linden, N.J. Advanced Energy Systems Lab.
CONCEPTUAL DESIGN OF A SOLAR COGENERATION FACILITY INDUSTRIAL PROCESS HEAT. VOLUME 2: APPENDICES Final Report, 30 Sep. 1980 - 14 Aug. 1981
Patrick Joy, Martin Brzeczek, Harold Seilestad, Carl Silverman, and George Yenetchi Jul. 1981 412 p Prepared in cooperation with Badger Energy, Inc., Cambridge, Mass., and Martin Marietta Aerospace, Denver, Colo., and Pacific Gas and Electric Co., San Ramon, Calif.
(Contract DE-AC03-80SF-11438)
(DE82-001578; DOE/SF-11438/T1-Vol-2) Avail: NTIS HC A18/MF A01

The cogeneration facility systems specification defines the characteristics, and design and environmental requirements for the facility and the performance, characteristics and economic data for the solar additions as well as design data for the existing facility. Climatological data are presented for the site. GRA

N82-18703# Nebraska Univ., Lincoln.
MONITORING OF THERMAL STRATIFICATION OF THE STORAGE TANK OF THE MABEL LEE HALL SOLAR-HOT-WATER FACILITY Final Technical Report, 15 Oct. 1979 - 30 Nov. 1980
E. E. Anderson May 1981 37 p refs
(Contract DE-AC02-79CS-30247)
(DE82-002110; DOE/CS-30247/1) Avail: NTIS HC A03/MF A01

Measurements of temperatures and heat inputs for a large liquid solar storage unit were obtained with sufficient spatial and temporal resolution to permit verification of numerical models. Fourteen tests were conducted on the Mabel Lee Hall solar facility. During each two-day test, forty temperatures and three heat inputs were measured every 15 minutes. All the data were reported to DOE and are available for confirmation of numerical models of liquid solar storage units. Examination of the results of five of the tests including charging, discharging and simultaneous charge-discharge operational modes indicate that stratification was maintaind in the tank. The data also show that several natural circulation modes develop depending upon the manner in which the system was operated. DOE

N82-18704# Ecole Polytechnique, Montreal (Quebec). Center de Developpement Technologique.
CALCULATION OF THERMODYNAMIC EQUILIBRIA IN THE CARBONATE FUEL CELL, VOLUME 1. TASK 1: BINARY TERNARY AND QUARTERNARY PHASE DIAGRAMS CONTAINING Li(+), Na(+), K(+), CO3(=), SO3(=) AND OH(-) Final Report
A. D. Pelton, C. W. Bale, P. L. Lin, M. L. Saboungi, and M. Blander 31 Aug. 1981 182 p refs Prepared in cooperation with Argonne National Lab. 2 Vol.
(Contract DE-AC02-79ET-15416)
(DE82-000690; DOE/ET-15416/2-Vol-1) Avail: NTIS HC A09/MF A01

All available phase diagram and thermodynamic data on the eighteen binary systems containing Li(), Na(), K(), SO4(2+), and OH(+) have been collected and critically assessed. A set of self consistent thermodynamic parameters describing the free energies of all known compounds, solid solutions, and liquid solutions in the binary systems has been formulated. The phase diagrams have been calculated, and estimated error limits of all diagrams are given. Fourteen ternary phase diagrams containing Li(), Na(), K(), SO4(2+), CO3(2+) and OH(+) have been calculated from the assessed data for their binary subsystems with the aid of the Conformal Ionic Solution Theory. Comparison with experimental data is made where experimental diagrams are available and small ternary parameters are added where necessary. All calculated ternary phase diagrams are presented as polythermal projections of liquidus surfaces, and estimated error limits are given for each system. DOE

N82-18705# Ecole Polytechnique, Montreal (Quebec). Centre de Development Technologique.
CALCULATION OF THERMODYNAMIC EQUILIBRIA IN THE CARBONATE FUEL CELL, VOLUME 2. TASK 2: EQUILIBRIA BETWEEN THE CARBONATE ELECTROLYTE AND THE C-H-O-S GAS PHASE. TASK 3: VAPOUR PRESSURES AND THE VOLITISATION OF THE ALKALI SPECIES Final Report
C. W. Bale, A. D. Pelton, J. Melancon, M. L. Saboungi, and M. Blander 31 Aug. 1981 72 p refs Prepared in cooperation with Argonne National Lab. 2 Vol.
(Contract DE-AC02-79ET-15416)
(DE82-000689; DOE/ET-15416/2-Vol-2) Avail: NTIS HC A04/MF A01

A complete thermodynamic analysis has been performed upon eleven selected fuel feeds obtained after various pretreatment processes. The equilibrium partial pressures of some 34 gaseous species have been computed for each of the fuels at the anode inlet and outlet (75% hydrogen utilization). The complex gaseous equilibria of the fuels have been graphically represented with the aid of Gibbs ternary C-H-O composition triangles. The influence of temperature and pressure upon carbon deposition in the anode compartment has been determined and graphically presented. The effect of water addition upon carbon formation and upon free hydrogen production has been evaluated. The influence of sulfur impurities upon the gaseous equilibria in both electrode compartments and upon the chemical stability of the Ni/NiO electrodes has been assessed. DOE

N82-18706# Westinghouse Research and Development Center, Pittsburgh, Pa.
HIGH-TEMPERATURE, SOLID-OXIDE-ELECTROLYTE FUEL-CELL POWER-GENERATING SYSTEM Quarterly Report, 1 Dec. 1980 - 28 Feb. 1981
22 Mar. 1981 60 p refs
(Contract DE-AC02-80ET-1709)
(DE82-002095; DOE/ET-17089/T2) Avail: NTIS HC A04/MF A01

Porous support tube work was directed at reducing the firing temperature, where electrically heated furnaces that enable better zone temperature control can be utilized. Work on the air electrode for the FEA cell design concentrated on modifying the lanthanum manganite, to enhance its conductivity while matching its thermal expansion to that of the other fuel cell components. The thermal expansion and electrical resistivity of La0 5Ca0 5MnO3 were determined. An initial FBA cell was fabricated. Although its performance was below that of the cells in the series cell stack arrangement, it did prove that fabrication of all fuel cell components (including the interconnection) can be accomplished in this cell design. Analytical measurements on an actual HTSOE cell stack resulted in the use of the differential resistance ((RADIAL)V/(RADICAL)I) to isolate voltage losses under operating conditions, envisaged for the HTSOE fuel cell generator. DOE

N82-18707# Service de la Programmation de la Politique Scientifique, Brussels (Belgium).
NATIONAL ENERGY RESEARCH AND DEVELOPMENT PROGRAM [PROGRAMME NATIONAL DE RECHERCHE-DEVELOPPEMENT DANS LE DOMAINE DE L'ENERGIE]
1980 23 p In FRENCH
Avail: NTIS HC A02/MF A01

This bibliography cites 24 reports generated by a program designed to study the national energy system, possibilities for energy conservation, and the use of new energy sources in Belgium. Topics covered include a mathematical model of the energy system; social impacts; regional aspects; the energy infrastructure; compatibilities, energy consumption in buildings and industries; the use of solar energy; heat recovery and storage; and the use of fossil fuels. Transl. by A.R.H.

N82-18708# Technische Hogeschool, Delft (Netherlands). Lab. for Thermal Power Engineering.
CYCLE: A GENERAL COMPUTER CODE FOR THERMODYNAMIC CYCLE COMPUTATIONS. STUDIES OF COGENERATION IN DISTRICT HEATING SYSTEMS
J. A. Miedema Sep. 1981 272 p refs
(WTHD-135) Avail: NTIS HC A12/MF A01

Computer programs which determine the energy consumption of heat power units, calculate the energy consumed by large scale district heating systems, compute the energy consumption per unit heat (f factor), and estimate the effect of dual purpose units on energy production/consumption of a regional scale power network were developed. District heating systems were assessed, using the programs. Systems with steam and gas units have lowest f factors. Regional power production efficiency is influenced by dual purpose units. The influence must be calculated for each case separately. Accurate computation of the f factor is urged since it is directly linked to the benefits/cost ratio.
Author (ESA)

N82-18709# Technische Hogeschool, Delft (Netherlands). Sectie Koudetechniek en Klimaartregeling.
INDOOR CLIMATE, OUTDOOR CLIMATE, AND ENERGY CONSUMPTION. AN APPROACH TO THE CALCULATION OF THE EFFECT OF THE OUTDOOR AND INDOOR CLIMATE ON THE ENERGY CONSUMPTION IN BUILDINGS, BASED ON METHODS OF STATISTICAL ANALYSIS
A. H. C. vanPaassen Oct. 1981 123 p refs
(WTHD-137) Avail: NTIS HC A06/MF A01

Mathematical models of the thermal system were developed, including the thermal behavior of the building, the outdoor climate and the heating, ventilation and air conditioning (HVAC) system. The thermal behavior of the building is characterized by the response factor method. A stochastic model describes outdoor climate characteristics. A short reference year, consisting of data from 16 days/season, is used as a standard input data set for hour by hour simulations of thermal systems associated with the building. Yearly energy consumption is determined by combining a probability matrix, based on the statistical properties of the weather, with an energy matrix, found by calculating the energy consumption of the HVAC system for all possible combinations of the temperature and humidity of the outdoor air and the load of the building. Results agree closely with measured values and computing time is greatly reduced.
Author (ESA)

N82-18710# Technische Hochschule, Aachen (West Germany). Lehrauftrag Leistungsreaktoren.
RAILWAY TRANSPORT OF LOW TEMPERATURE HEAT FROM LARGE POWER STATIONS BY MEANS OF ALTERNATIVE HEAT CARRIERS AND WATER Final Report
Gerardus Luchtman and Theo Bracke Bonn Bundesministerium fuer Forschung und Technology Nov. 1981 165 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-145; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 32,60

The feasibility of railway transport of liquid and solid heat carriers in tank cars so as to replace pipeline transport of small to medium large heat loads was investigated. The typical characteristics of railway transport were analyzed and all essential technical and economical variables were integrated in a transport model. Over 1000 complex chemical compounds were evaluated for their suitability as heat carriers. Of these, three ammonia compounds are considered as promising. Considering, however, that complicated and expensive facilities are needed for heat transfer to and from ammonia, water is identified as the better choice. Results, based on 1975 transport prices, show that railway heat transport becomes competitive for heat loads above 50 to 100 MW and transport distances over 20 km. Author (ESA)

N82-18711# Stuttgart Univ. (West Germany). Abt. Heizung-Lueftung-Klimatechnik.
MODEL OF SEASONAL HEAT STORAGE Final Report
Wilhelm Adae and Dieter Striebel Bonn Bundesministerium fuer Forschung und Technologie Oct. 1981 237 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-176; ISSN-0340-7608) Avail: NTIS HC A11/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 40,30

A model of the thermal behavior of large flat seasonal storage reservoirs which includes all parameters influencing the temperature distribution was developed and compared with experiment in order to provide a comprehensive basis for the dimensioning and design of displacement storage reservoirs. Heat transfer by conduction and by various convective flows at the side walls and the fluid surface were included in a numerical one-dimensional model of the stagnant reservoir and the results were compared with measured temperature distributions. The influence of charging and decharging on the stability of the thermocline was investigated by visualization of the flow and mixing processes and by temperature measurements. Model calculations of the mixing losses indicate that the mixing is nearly compensated by conduction when the reservoir charging time exceeds 1000 hr approximately. Author (ESA)

N82-18712# Vereinigte Elektrizitaetswerke Westfalen A.G., Dortmund (West Germany). Hauptnereich Maschinentechnik.
CONSTRUCTION AND OPERATION OF A ONE TON PER HOUR PILOT PLANT FOR THE VEW COAL CONVERSION PROCESS Final Report, Feb. 1981
Juergen Poller Bonn Bundesministerium fuer Forschung und Technology Nov. 1981 57 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-177; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12,20

The pilot plant is based on airblown partial gasification in an entrained reactor. Results show that at temperatures of about 1450 C, 55% to 65% of the feed coal, and 70% to 80%

of the sulfur can be converted into product gas. The quality of the low BTU gas is sufficient for application in the combined gas-stream turbine process. Extensive knowledge is also gained concerning gas accompanying pollutants and the behavior of different brickwork materials in the reactor environment. The acquired data allows proper dimensioning of a prototype plant.
Author (ESA)

N82-18713# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
A 100 kWe SOLAR THERMAL POWER PLANT IN KUWAIT, PHASE 1 Final Report, Jun. 1980
Guenther Schmidt, Peter Schmid, Dietmar Wolf, and Helmut Zewen Bonn Bundesministerium fuer Forschung und Technology Oct. 1981 47 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-178; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,10

The assembly and test program of the main system components of the solar thermal power station are described. The installation is of the solar farm type and uses highly concentrating rotational symmetric paraboloid mirrors to achieve high efficiencies and Rankine cycle operating temperatures as high as 350 C. The working medium is toluene. Performance tests show proper functioning of the tracking system of the collectors, of the coneshaped absorbers and of the energy conversion system, including all control loops. Author (ESA)

N82-18714# Maschinenfabrik Augsburg-Nuernberg A.G., Munich (West Germany).
CONSTRUCTION AND TESTING OF A TEST STAND FOR SOLAR CELLS AND CONCENTRATING COLLECTORS Final Report, Apr. 1980
Heinz Pfeiffer Bonn Bundesministerium fuer Forschung und Technology Nov. 1981 131 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-179; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27,70

A hibrid system consisting of photovoltaic cells and parabolic concentrators was built and tested in order to study the possible cost reduction of photovoltaic systems by concentration of sunlight. The test stand comprises four parabolic tracking reflectors, a cooling circuit, electrical and thermodynamical instrumentation and an electrical water pump as a load. The solar cells are mounted in the focal line of the collectors on a cooling channel designed for optimal heat transfer and their uniform illumination is carefully adjusted. The photovoltaic generator delivers electrical energy with 9.3% efficiency at 25 C. In the hybrid regime the thermal efficiency attains 45% at a temperature of 90 C, and the electrical efficiency 6%. Author (ESA)

N82-18715# Metallgesellschaft, A.G., Frankfurt am Main (West Germany).
DEVELOPMENT OF SELECTIVE SOLAR ABSORBERS ON THE BASIS OF ALUMINUM ROLL-BOND HEAT EXCHANGERS Final Report, Jun. 1980
Manfred Moeller Bonn Bundesministerium fuer Forschung und Technology Nov. 1981 44 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-183; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 9,25

A deposition technique comparable to two-stage anodizing and especially suited for solar absorber panels, using roll-bond Al 99.5 and AlMnZr alloys as a substrate, was developed. The coating is of the nickel structure filter type and provides average solar absorptivity values of 94% and thermal emission values of 14%. The setup of a production plant capable of coating surfaces up to 2 sq m is described as well as the development of corrosion resistent hermetically sealed collectors. By means of an appropriate surface treatment the same corrosion resistance was achieved for absorbers mounted in ventilated collectors. Author (ESA)

N82-18716# Metallgesellschaft, A.G., Frankfurt am Main (West Germany). Metall-Lab.
AIRTIGHT COLLECTOR CASINGS Final Report
Manfred Moeller Bonn Bundesministerium fuer Forschung und Technology Oct. 1981 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-184; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,20

The gas space between absorber and cover plates is hermetically sealed by means of a permanent elastic seal of the polysulfide or polyisobutylene type. The absorber-glass bond fits into a special frame to be manufactured and mounted industrially for easy assembly with titanium-zinc roof structures. The latter is made of prefabricated parts that can easily be joined by soldering. Adequate protection against penetration of rain, water, snow, and dust is provided for. The flat roof mounting is so designed that no boring through the cover is needed for fixing. Test results show high efficiency and long service life.
Author (ESA)

N82-18717# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DEVELOPMENT OF SELECTIVE SOLAR ABSORBERS ON THE BASIS OF ALUMINUM ROLL-BOND HEAT EXCHANGERS Final Report, Dec. 1979
Werner Scherber and Bernhard Schroeder Bonn Bundesministerium fuer Forschung und Technology Oct. 1981 105 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-186; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,30

A deposition technique for selective coatings akin to two-stage anodizing and especially suited for aluminum solar absorber panels was developed. The coating consists of tiny, velvet-like arranged nickel whiskers and provides a solar absorptivity as high as 94% and a low thermal emissivity of 12% to 17%. The coating technique, the production setup, and the test program are described. The coating proves to be resistent to humidity cycle testing and may be used in ordinary ventilated collectors. After production in a pilot production plant of about 10,000 roll-band panels with outstanding optical quality, homogeneity and long-term stability, a series production plant with a 7 m bath length was started. Author (ESA)

N82-18718# AEG-Telefunken, Wedel (West Germany). Fachbereich Neue Technologien, Raumfahrt.
DEVELOPMENT AND TESTS OF EXPERIMENTAL SOLAR GENERATORS FOR CONCENTRATING SYSTEMS Final Report, Mar. 1981
Hans Gochermann and Hubert Muehle Bonn Bundesministerium fuer Forschung und Technology Oct. 1981 34 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technology
(BMFT-FB-T-81-193; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,20

Terrestrial photovoltaic generators were developed for integration into a hybrid system designed to demonstrate cost reduction of photovoltaic systems by concentration of sunlight. The photovoltaic cells consist of monocrystalline silicon, n-p type, 5 by 5 sq cm large and 0.35 mm thick. The antireflection layer is made of TiOx and the contact system of passivated Ti(Pd)Ag. Usage of low ohmic materials and decrease of contact resistance by deeper n-diffusion allows for maintaining cell efficiency almost constant for intensities up to 0.2 W per sq cm. The layout of several hybrid systems using parabolic reflectors is given and the mounting of the solar cells is illustrated. Author (ESA)

N82-18719# Aeronautical Research Inst. of Sweden, Stockholm.
A TWO DIMENSIONAL STUDY OF THE MAXIMUM POWER THAT CAN BE OBTAINED FROM A WIND TURBINE IN A WIND SHEAR LAYER
Bo C. A. Johansson Apr. 1981 59 p refs
(FFA-134; ISSN-0081-5640) Avail: NTIS HC A04/MF A01; Aeronautical Research Inst. of Sweden, Stockholm Kr 70

Betz's stream tube theory for the maximum power that can be obtained from a wind turbine in a uniform flow is extended to two dimensions. The undisturbed velocity field (allowed to vary arbitrarily vertically) and the location of the wind turbine are given. The maximum power is calculated by calculus of variations. For common wind velocity profiles, the maximum power is only slightly larger than the power, which is obtained by a constant relative wind speed retardation equal to Betz's retardation, while for a linear velocity profile there is a considerable difference. Author (ESA)

N82-18720# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

MEASUREMENTS OF WAKE INTERACTION EFFECTS ON THE POWER OUTPUT FROM SMALL WIND TURBINE MODELS

Per-Henrik Alfredsson and Jan-Aake Dahlberg 4 Jul. 1981 62 p refs

(Contracts NE-5061-013; NE-5061-014)

(FFA-TN-HU-2189-Pt-5; ISSN-0081-5640) Avail: NTIS HC A04/MF A01

Power interference between two and three wind turbine models in a wind tunnel at four different ambient turbulence conditions was measured in order to assess turbine drag effects. Maximum power coefficient is 0.35 with a corresponding thrust coefficient of 0.85 at a tip speed ratio of 4. Flow visualization with small spacing between the turbines (2 x D) and power interaction measurements show that the presence of a downstream turbine affects the upstream turbine wake. By traversing a turbine across the wake of an upstream turbine, a chart of constant power lines (iso power lines) was established for the four ambient flow conditions. The power measurements in the wake can be used to estimate the overall efficiency of a limited array of wind turbines. Author (ESA)

N82-18721# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.

ICING PROBLEMS FOR WIND TURBINES. SUMMARY OF STUDIES PERFORMED DURING WINTER SEASON 1980/81

Anders Gustafsson, Tord Kvick, and Staffan Meijer (Swedish Meteorological and Hydrological Inst.) 6 Oct. 1981 30 p refs Prepared in cooperation with Sydkraft AB

(Contract NE-5061-014)

(FFA-TN-HU-2262-Pt-4) Avail: NTIS HC A03/MF A01

The significance of an ice detector signal which shuts down a wind energy conversion system, not equipped with deicers, was studied. Correlations between the detector signal, meteorological parameters and ice buildup on the blades were investigated. Theoretical and field study data were used. Visual checks followed icing signals but little ice was observed since icing mostly occurred at night. The data are inadequate to enable conclusions to be drawn. Time lag between signals and visual observation must be shortened. Data must be collected when icing is expected, even if there is no signal. Author (ESA)

N82-18722# National Mechanical Engineering Research Inst., Pretoria (South Africa). Heat Mechanics Div.

EXPERIMENTAL INVESTIGATION OF HEAT AND MASS TRANSFER RATES IN REGENERATING TYPE SOLAR COLLECTOR

A. Johannsen Apr. 1981 31 p refs

(PB82-112244; CSIR-ME-1705; ISBN-00-7988-1475-6) Avail: NTIS HC A09/MF A01 CSCL 10A

Heat and mass transfer rates and air pressure drop in a regenerating type solar collector over the range of operating conditions expected in a real system were measured in a laboratory. The existence of analogy between heat and mass transfer in the collector was confirmed. GRA

N82-18723# Institute for Telecommunication Sciences, Boulder, Colo.

ELECTROMAGNETIC COMPATIBILITY ANALYSIS FOR A SATELLITE POWER SYSTEM RECEIVING SITE IN THE MOJAVE DESERT

E. L. Morrison, W. B. Grant, and E. J. Lutton Jun. 1981 86 p refs Sponsored in part by DOE

(PB82-100710; NTIA/Rept-81-76) Avail: NTIS HC A05/MF A01 CSCL 10B

The Satellite Power System (SPS) as a source of baseline electrical power was evaluated. The SPS program develops an initial understanding of the technical feasibility, the economic practicality, and the social and environmental acceptability of the SPS concept. Electromagnetic compatibility (EMC) of an SPS with existing and planned electromagnetic and electronic systems is illustrated. A methodology is developed for rectenna site EMC analysis and impact evaluation. GRA

N82-18724# National Bureau of Standards, Washington, D.C. Center for Building Technology.

ENERGY MANAGEMENT AND CONTROL SYSTEMS (EMCS) USER SATISFACTION STUDY

Gary W. Dickinson Aug. 1981 20 p refs Sponsored in part by DOE, Washington, D.C.

(PB82-103656; NBSIR-81-2346) Avail: NTIS HC A02/MF A01 CSCL 13A

A study of 86 energy management and control systems (EMCS) was made. Users' satisfaction and perceived system reliability was determined. GRA

N82-18725# Booz-Allen and Hamilton, Inc., Bethesda, Md.

EVALUATION OF RESIDENTIAL AND COMMERCIAL SOLAR/GAS HEATING AND COOLING TECHNOLOGIES. VOLUME 1: PROGRAM OVERVIEW Final Report, Dec. 1979 - Jan. 1981

Alan S. Hirshberg, Steven A. Haas, and Alan S. Jacobsen Dec. 1980 64 p 2 Vol.

(Contract GRI-5014-345-0280)

(PB82-103847; GRI-79/0105.1) Avail: NTIS HC A04/MF A01 CSCL 13A

The technologies and economics of solar/gas systems for application in the single-family residential market and in the small (individual building) commercial market were evaluated. The effects of solar industry maturity on system cost and the impact of solar incentives and natural gas price uncertainties on solar/gas system economics were studied. Projected solar/gas systems with advanced conventional gas equipment such as pulse combustion furnaces are discussed. GRA

N82-18726# Booz-Allen and Hamilton, Inc., Bethesda, Md.

EVALUATION OF RESIDENTIAL AND COMMERCIAL SOLAR/GAS HEATING AND COOLING TECHNOLOGIES, VOLUME 2 Final Report, Dec. 1979 - Jan. 1981

Alan S. Hirshberg, Steven A. Haas, and Alan S. Jacobsen Dec. 1980 287 p 2 Vol.

(Contract GRI-5014-345-0280)

(PB82-103854; GRI-79/0105.2) Avail: NTIS HC A13/MF A01 CSCL 13A

The economics of the most cost-effective solar/gas hybrid systems against a range of advanced gas-fired space conditioning equipment, including both conventional gas furnaces and pulse combustion gas furnaces were analyzed. In addition, the economic comparison considered improvements in performance and cost reduction for both solar/gas systems and advanced gas-fired equipment. GRA

N82-18727# National Bureau of Standards, Washington, D.C. Center for Building Technology.

CRITERIA FOR THE INSTALLATION OF ENERGY CONSERVATION MEASURES Final Report

Heinz R. Trechsel and Shelia J. Launey (DOE, Washington, D.C.) Jul. 1981 207 p refs Sponsored in part by DOE, Washington, D.C.

(PB82-104712; NBS-SP-606; LC-81-600055) Avail: NTIS HC A10/MF A01 CSCL 13A

Standard installation practices were developed to assist in assuring the effectiveness and safety of energy conservation measures. The criteria are being used by DOE to develop training manuals for installers, inspectors, and energy auditors. Issues that were considered in the development of the standards: moisture and building retrofit, attic ventilation, electrical wiring, recessed and surface-mounted fixtures, the use of diagnostic tools (infrared thermography, air change rate, and window air leakage measurements), and product certification are discussed. The products covered are loose-fill, batts and blankets, rigid foam boards, UF foam and reflective insulations, window devices, caulks

and sealants, water heater insulation, oil burner replacements, and vent dampers. GRA

N82-18728# National Bureau of Standards, Washington, D.C. Center for Building Technology.
PERFORMANCE OF THE NORRIS COTTON FEDERAL OFFICE BUILDING FOR THE FIRST 3 YEARS OF OPERATION Final Building Sciences Series
James E. Hill, William B. May, Jr., Thomas E. Richtmyer, Jacqueline Elder, Robert L. Tibbott, Gary T. Yonemura, Charles M. Hunt, and Phillip T. Chen Aug. 1981 143 p refs Sponsored in part by DOE, Washington, D.C.
(PB82-105487; NBS-BSS-133; LC-81-600082) Avail: NTIS HC A07/MF A01 CSCL 13A

The Norris Cotton Federal Office Building, designed to demonstrate a number of energy saving concepts, is discussed. Some of the major energy conserving features of the building are the use of solar collectors; heavy masonry construction with exterior insulation; small overall window area; heat recovery from heat pumps, chillers, a natural gas-powered engine/generator, and the ventilation system; modular boilers; thermal storage tanks; and a variety of energy conserving lighting systems. GRA

N82-18729# National Bureau of Standards, Washington, D.C. Center for Building Technology.
FEDSOL: PROGRAM USER'S MANUAL AND ECONOMIC OPTIMIZATION GUIDE FOR SOLAR FEDERAL BUILDING PROJECTS Final Report
Jeanne W. Powell and Richard C. Rodgers, Jr. Aug. 1981 113 p refs Prepared in cooperation with Rodgers (Richard C.), Jr. Sponsored in part by DOE
(PB82-107012; NBSIR-81-2342) Avail: NTIS HC A06/MF A01 CSCL 13A

A user's manual for the FEDSOL computer program is provided. The FEDSOL program determines the economically optimal size of a solar energy system for a user-specified building, location, system type, and set of economic conditions; it conducts numerous breakeven and sensitivity analyses; and it calculates measures of economic performance as required under the Federal Rules. The economic model in the program is linked with the SLR (solar load ratio) design method developed to predict the performance of active systems. The economics portion of the program can, however, be used apart from the SLR method, with performance data provided by the user. Author

N82-18730# KVB, Inc., Minneapolis, Minn.
EMISSIONS AND EFFICIENCY PERFORMANCE OF INDUSTRIAL COAL STOKER FIRED BOILERS Final Report, Aug. 1977 - Nov. 1979
P. L. Langsjoen, J. O. Burlingame, and J. E. Gabrielson Jul. 1981 347 p refs Prepared in part by American Boiler Manufacturers Association
(Contracts EPA-IAG-D7-E681; EF-77-C-01-2609)
(PB82-115312; EPA-600/7-81-111A) Avail: NTIS HC A15/MF A01 CSCL 13A

Measurements of 18 coal stoker boilers including spreader stokers, mass fired overfeed stokers, and mass fired underfeed stokers are reported. Particulate loading is largely dependent on stoker type and degree of flyash reinjection. It increases with heat release rate, but can be controlled with proper use of overfire air in many cases. Nitric oxide increases with excess air and grate heat release rate. Overfire air, as it exists in current boiler designs, does not affect NOx. Relationships between operating variables and measured emissions and efficiency are also reported. GRA

N82-18731# Midland-Ross Corp., Toledo, Ohio. Thermal Systems Technical Center.
INDUSTRIAL BURNER AND PROCESS EFFICIENCY PROGRAM Annual Report, Jan. - Dec. 1980
S. R. Huebner and S. N. Prakash Mar. 1981 96 p refs
(GRI Proj. 5011-342-0148)
(PB82-115486; GRI-80/0059; Rept-1228) Avail: NTIS HC A05/MF A01 CSCL 13A

A laboratory prototype burner which is compatible with a FM (frequency modulation) combustion control system where temperature control is accomplished by regulating the ratio of burner on-time to burner off-time was developed. This multifuel (natural gas and No. 2 fuel oil) high velocity burner is capable of repeated pulse ignition at maximum rated capability (1 million Btu-hour) with preheated air (from ambient to 1100F). A digital control in the FM mode was developed. Experimental data from tests in a laboratory furnace indicated that when applied to a batch type thermal process where appreciable turndown is presently obtained by excess air operation, the FM combustion system provides improvements in process fuel efficiency and gains in productivity. Author

N82-18732# Carltech Associates, Columbia, Md.
GEOTHERMAL ENERGY MARKET STUDY ON THE ATLANTIC COASTAL PLAIN: TECHNICAL FEASIBILITY OF USE OF EASTERN GEOTHERMAL ENERGY IN VACUUM DISTILLATION OF ETHANOL FUEL
J. Carl Uhrmacher Apr. 1981 35 p refs Prepared for APL, Laurel, Md.
(Contracts EX-78-A38-1008; DE-AI01-79FT-27025; N00024-81-C-5301)
(PB82-123001; JHU/APL/QM-81-066) Avail: NTIS HC A03/MF A01 CSCL 07A

The application of modest temperature geothermal water in combination with a vacuum system for the distillation of fuel grade ethanol is analyzed. The case analyzed was for geothermal water temperatures typical of what might be found on the Atlantic Coastal Plain, i.e., 150 F, and a vacuum of 130 mm Hg, i.e., currently in use in a farm scale vacuum distillation system in Ohio. GRA

N82-18733# National Oceanic and Atmospheric Administration, Washington, D. C.
COMMERCIAL OCEAN THERMAL ENERGY CONVERSION (OTEC) LICENSING FINAL ENVIRONMENT IMPACT STATEMENT Final Environmental Impact Statement
Jul. 1981 284 p refs
(PB82-117532; NOAA-81082705) Avail: NTIS HC A13/MF A01 CSCL 10B

The effects of licensing commercial ocean thermal energy conversion (OTEC) development on human activities and the atmospheric, marine and terrestrial environments are identified and assessed. Alternate regulatory approaches for mitigating adverse environmental impacts associated with siting, design, and operation of commercial OTEC plants are evaluated, and the preferred regulatory alternative identified. Author (GRA)

N82-18734# Illinois Univ. at Chicago Circle, Chicago.
ENERGY CONSUMPTION PATTERNS: ILLINOIS, INDIANA, KENTUCKY, OHIO, PENNSYLVANIA, AND WEST VIRGINIA (1975)
James P. Hartnett and Jan L. Saper Apr. 1981 80 p refs (Grant EPA-R-805588)
(PB82-101478; EPA-600/7-81-066) Avail: NTIS HC A05/MF A01 CSCL 10A

Energy consumption data for the year 1975 for the states of Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia, as well as for the United States as a whole is presented. Energy use is examined both by consuming sector and by fuel source. The principal components of each sector are described briefly, and detailed comparisons are made among national, six-state, and individual state consumption patterns for 1975. Preliminary estimates are given for total energy consumption in the United States, the six states, and individual states for the years 1976, 1977, and 1978. GRA

N82-18735# Purdue Univ., Lafayette, Ind.
OHIO RIVER BASIN ENERGY STUDY: SOCIAL VALUES AND ENERGY POLICY
Harry R. Potter and Heather J. Norville Apr. 1981 152 p refs Prepared in cooperation with Ohio River Basin Energy Study
(Grants EPA-R-806451; EPA-R-805585)
(PB82-101494; EPA-600/7-81-053) Avail: NTIS HC A08/MF A01 CSCL 10A

American social values and their relationship to energy production and use within the the Ohio River Basin area are identified and analyzed. The major topics are (1) an overview of social values and energy policy, (2) an identification of values implicit in the Ohio River Basin Energy Study scenarios, (3) a

secondary analysis of survey data, and (4) a discussion of variations in social values by social and demographic characteristics. GRA

N82-18736# West Virginia Univ., Morgantown. Bureau of Business Research.
AN ECONOMIC ANALYSIS OF THE ELECTRIC UTILITY SECTOR IN THE OHIO RIVER BASIN REGION
Patrick C. Mann and Tom S. Witt Apr. 1981 106 p refs Prepared in cooperation with Ohio River Basin Energy Study
(Grant EPA-R-805585)
(PB82-103268; EPA-600/7-81-047) Avail: NTIS HC A06/MF A01 CSCL 10A

The potential effects of different pricing mechanisms on capacity requirements, load factors, and fuel costs are discussed, with particular attention paid to their implications for the Ohio River Basin Region. Two sets of estimates for various elasticities of demands are presented. Regulatory policy and its effect upon electricity demand and pricing are studied. GRA

N82-18737# Kentucky Univ., Lexington.
A BASELINE ASSESSMENT OF COAL INDUSTRY STRUCTURE IN THE OHIO RIVER BASIN ENERGY STUDY REGION
David S. Walls, Dwight B. Billings, Mary P. Payne, and Joe F. Childers, Jr. Apr. 1981 581 p refs Prepared in cooperation with Ohio River Basin Energy Study
(Grant EPA-R-805585)
(PB82-103615; EPA-600/7-81-058) Avail: NTIS HC A25/MF A01 CSCL 10A

Detailed information is provided on coal production and employment by county, the consumption and distribution of coal, the ownership structure of the coal industry, coal land and mineral ownership, operator associations and unions in the coal industry, and projections of coal development. The emphasis is on the six ORBES states (Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia), but information also is provided on the coal industry in the other eastern states and the western states when relevant. GRA

N82-18738# West Virginia Univ., Morgantown.
WEST VIRGINIA BASELINE
Vincent P. Cardi, ed., Charles Baer, Anna Graham, Thomas Hall, Dennis Rankin, and Thomas J. Sweet Apr. 1981 491 p refs Prepared in cooperation with Ohio River Basin Energy Study Original contains color illustrations
(Grant EPA-R-805585)
(PB82-103672; EPA-600/7-81-050) Avail: NTIS HC A21/MF A01 CSCL 10A

Baseline information on West Virginia is provided. The topics covered are terrestrial ecology, aquatic ecology, geology and climatology, socioeconomics, and a legal analysis of institutional accountability. The hydrology, water quality, endangered species, and clean streams of five river basins are described. GRA

N82-18739# West Virginia Univ., Morgantown. Bureau of Business Research.
ENERGY CONSUMPTION IN THE OHIO RIVER BASIN ENERGY STUDY REGION, 1974, BY END USER AND FUEL TYPE
Walter P. Page Apr. 1981 66 p refs Prepared in cooperation with Ohio River Basin Energy Study
(Grant EPA-R-805585)
(PB82-104811; EPA-600/7-81-048) Avail: NTIS HC A04/MF A01 CSCL 10A

Energy consumption as of 1974 is calculated for the Ohio River Basin region (substantial parts of Illinois, Indiana, and Ohio, all of Kentucky, most of West Virginia, and southwestern Pennsylvania). Substate energy consumption information is obtained at the Bureau of Economic Analysis (BEA) level and aggregated across BEA areas for an approximation to the Ohio River Basin Energy Study (ORBES) region; a set of factors is applied to allocate partial BEA area energy consumption to the ORBES portion of a given BEA area. Comparisons also are made between regional energy consumption and energy consumption in the six-state area and the United States. GRA

N82-18740# Illinois Univ. at Chicago Circle, Chicago.
THE OHIO RIVER BASIN ENERGY FACILITY SITING MODEL. VOLUME 1: METHODOLOGY
Gary L. Fowler, Robert E. Bailey (Ohio State Univ., Columbus), Steven I. Gordon (Ohio State Univ., Columbus), Steven D. Jansen, J. C. Randolph (Indiana Univ., Bloomington), and W. W. Jones (Indiana Univ., Bloomington) Apr. 1981 196 p refs
(Grants EPA-R-805588; EPA-R-805589; EPA-R-805609)
(PB82-102591; EPA-600/7-81-042) Avail: NTIS HC A09/MF A01 CSCL 10B

The siting model developed for ORBES is specifically designed for regional policy analysis. The region includes 423 counties in an area that consists of all of Kentucky and substantial portions of Illinois, Indiana, Ohio, Pennsylvania, and West Virginia. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-18741*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIMS INSTRUMENT PACKAGE (LIP) BALLOON EXPERIMENT: NIMBUS 7 SATELLITE CORRELATIVE TEMPERATURE, OZONE, WATER VAPOR, AND NITRIC ACID MEASUREMENTS
Robert B. Lee, III, Bruce W. Gandrud (National Center for Atmospheric Research), Donald E. Robbins (NASA. Johnson Space Center), Laurence C. Rossi (NASA. Wallops Flight Center), and Nigel R. W. Swann (National Physical Lab., London) Feb. 1982 41 p refs
(NASA-TM-83259) Avail: NTIS HC A03/MF A01 CSCL 13B

The Limb Infrared Monitor of the Stratosphere (LIMS) LIP balloon experiment was used to obtain correlative temperature, ozone, water vapor, and nitric acid data at altitudes between 10 and 36 kilometers. The performance of the LIMS sensor flown on the Nimbus 7 Satellite was assessed. The LIP consists of the modified electrochemical concentration cell ozonesonde, the ultraviolet absorption photometric of ozone, the water vapor infrared radiometer sonde, the chemical absorption filter instrument for nitric acid vapor, and the infrared radiometer for nitric acid vapor. The limb instrument package (LIP), its correlative sensors, and the resulting data obtained from an engineering and four correlative flights are described. E.A.K.

N82-18742# Princeton Univ., N. J. Dept. of Chemical Engineering.
GAS-SURFACE INTERACTIONS IN CRYOGENIC WHOLE AIR SAMPLING Final Report, 1 Nov. 1976 - 31 Mar. 1980
J. M. Calo, R. J. Fezza, and E. J. Dineen May 1981 418 p refs
(Contract F19628-77-C-0071; AF Proj.*6687)
(AD-A108255; AFGL-TR-81-0162) Avail: NTIS HC A18/MF A01 CSCL 20/12

Physico-chemical phenomena associated with in-situ cryogenic whole air sampling of stratospheric species are examined. Condensation phenomena on disks of various materials, cooled by a mechanical, helium cycle refrigerator, and subsequent thermal desorption behavior were studied using quadrupole mass spectrometry and NO chemiluminescence. Strong, spurious 'first' condensations in the 200-250 K temperature range were observed. This phenomenon is attributed to water vapor contamination of the surface resulting in supersaturation and condensate growth initiation by surface nucleation. Desorption spectra of binary cryofrosts and of the pure components revealed significant levels of interaction between species in the cryofrost. These results preclude chromatographic cryo-fractionation as a reliable technique for whole air sample and analysis. Reactions which occur during cryofrost regeneration were studied via temperature programmed and flash desorption. Surprisingly persistent disproportionation of NO occurred with conversions of nearly 50 percent upon desorption of NO containing cryofrosts. Rapid ozone recombination and oxidation of NO to NO2 by ozone are also reported. GRA

N82-18743# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.

INCORPORATION OF ENVIRONMENTAL IMPACT INDICES INTO NOISEMAP Final Report
Harry Seidman Wright-Patterson AFB, Ohio Air Force Aerospace Medical Research Labs. Nov 1981 33 p refs
(Contract F33615-79-C-0516; AF Proj. 7231)
(AD-A108616; BBN-4444; AFAMRL-TR-81-31) Avail: NTIS HC A03/MF A01 CSCL 20/1

NOISEMAP and the General Purpose Contouring Program (GPCP) were modified to be compatible with the SITE II demographic data base and software program. This means that population and socioeconomic status information from census tract tapes can be routinely obtained for noise contour areas generated using NOISEMAP. NOISEMAP Version 4.1 identifies to all users this new demographic overlay capability and the recent (Feb 80) update of the military aircraft noise data base (NOISEMAP) that revised the algorithm for predicting sound duration as a function of propagation distance. Author (GRA)

N82-18744# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
INVESTIGATION ON AIR SAMPLES FROM THE SUBMARINE SJOEHUNDEN, AUGUST 1979 [UNDERSOEKNING AV LUFTPROVER FRAAN UBAATEN SJOEHUNDEN, AUGUSTI 1979]
L.-H. Andersson, A. Braend-Persson, B. Gelin, A. Linnarson, and G. Ringqvist Oct. 1981 61 p refs In SWEDISH
(FOA-C-54035-H1) Avail: NTIS HC A04/MF A01

Hydrocarbon and aerosol concentrations in a submarine during a dive were investigated. Oil particles and gaseous hydrocarbons, due to an oil leak and kitchen fumes, were detected. Heavy metals did not occur, except small amounts of copper and zinc. In some cases fibers were found, possibly asbestos. In many cases textile fibers were found. In most of the filters, carbon particles and traces of evaporated seawater were present. The submarine atmospheric dust content is not dangerous to the crew's health. Author (ESA)

N82-18745# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
INVESTIGATIONS ON AIR SAMPLES FROM THE SUBMARINE NAECKEN, AUGUST 1980 [UNDERSOEKNING AV LUFTPROVER FRAAN UBAATEN NAACKEN, AUGUSTI 1980]
Aasa Braend-Persson, Allan Linnarson, and Goesta Ringqvist Oct. 1981 37 p refs In SWEDISH
(FOA-C-54036-H1) Avail: NTIS HC A03/MF A01

Hydrocarbon pollution of the atmosphere in a submarine was investigated, and aerosol density was measured. A small oil leak was noticed as well as intake of diesel exhaust during snorkelling. The hydrocarbon concentration was low; provided these components are limited to hydraulic fluids, lubricating oils, or kitchen fumes, the recorded concentration probably is not dangerous to health. Dust particle density is lower than that of a house. Author (ESA)

N82-18746# Arkansas-White-Red Basins Inter-agency Committee, Amarillo, Tex.
PLANNING PROCESS STUDY: ARKANSAS-WHITE-RED RIVER BASINS
Jul. 1981 93 p refs Sponsored in part by Water Resources Council, Washington, D.C.
(PB82-111584) Avail: NTIS HC A05/MF A01 CSCL 13B

In an effort to properly scope the study and to assess the need for regional planning itself, State input was sought and received to determine the major water resources problems existing in the region. The major problems identified were inadequate ground and surface water supplies, degraded surface water quality and flooding of related lands. Author (GRA)

N82-18747# Ohio River Basin Commission, Cincinnati.
EXECUTIVE SUMMARY OF THE CUMBERLAND RIVER BASIN REGIONAL PLAN: WATER AND RELATED LAND RESOURCES REPORT
Jun. 1981 25 p Sponsored in part by Water Resources Council
(PB82-111519) Avail: NTIS HC A02/MF A01 CSCL 13B

A regional water resources management plan for the Cumberland River Basin in Virginia, Kentucky, and Tennessee is described. A comprehensive assessment of project needs, problems, and programs is made. GRA

N82-18748# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
AN EQUILIBRIUM MODEL FOR THE PARTITIONING OF SYNTHETIC ORGANIC COMPOUNDS: FORMULATION AND CALIBRATION
Brian J. Eadie May 1981 47 p refs
(PB82-116682; NOAA-TM-ERL-GLERL-35; NOAA-81081903) Avail: NTIS HC A03/MF A01 CSCL 06F

An equilibrium toxic organic distribution model has been designed. This simple model, needing only information on the contaminants, water solubility, and vapor pressure, yields useful information on the distribution of environmentally persistent organic contaminants. The model was calibrated for total DDT in three ecosystems: a representative coastal regime, Lake Michigan, and a global system. There are some discrepancies between model output and available data; while the model calibrated well for the coastal regime and the Lake Michigan ecosystem, it failed for the global ecosystem. This is presumably because of the uneven application of DDT and the large biomass of terrestrial plants, which are relatively uncontaminated. Owing to its low vapor pressure, DDT has not and will not come to a global equilibrium. GRA

N82-18749# National Academy of Sciences - National Research Council, Washington, D. C.
ENERGY AND THE FATE OF ECOSYSTEMS: STUDY OF NUCLEAR AND ALTERNATIVE ENERGY SYSTEMS. SUPPORTING PAPER 8
Oct. 1980 420 p refs
(PB82-113747; ISBN-0-309-03098-6; LC-80-83687) Avail: NTIS HC A18/MF A01 CSCL 06F

The Ecosystem Impacts Resource Group of the Risk and Impact Panel has attempted to identify the unresolved energy policy decisions whose future resolution will have the greatest effect in determining the fate of vulnerable ecosystems, and to assess the likelihood and consequences of undersirable modifications of these systems. GRA

N82-18750# Teknekron, Inc., McLean, Va.
ASSESSMENT OF FUTURE ENVIRONMENTAL TRENDS AND PROBLEMS: INDUSTRIAL USE OF APPLIED GENETICS AND BIOTECHNOLOGIES Final Report
Robert H. Zaugg and Jeff R. Swarz Sep. 1981 169 p refs
(Contract EPA-68-02-3638)
(PB82-118951; EPA-600/8-81-020) Avail: NTIS HC A08/MF A01 CSCL 06C

The proposed study is to be a technological assessment of genetic engineering as it applies to commercial industries and its potential effects on the environment. This includes a detailed literature review and state of the art analysis of genetic engineering, an analysis of how applied genetics will affect public health and public welfare, its probable impact on the environmental policies and an analysis of knowledge gaps, including identification of inadequacies of analytical methods and techniques. Additionally, the socioeconomic impact of genetic engineering on commercial industry will be examined. The approach will include a literature review of five key industrial sectors: Pharmaceutical and Cosmetic, Industrial Chemical, Energy, Food Manufacturing and Preservation, and Mining. Areas that will be examined at length include: Environment and Populations, Government Policy, and Technology. GRA

N82-18751# Radian Corp., Austin, Tex.
ENVIRONMENTAL ASSESSMENT, SOURCE TEST AND EVALUATION REPORT: LURGI (KOSOVO) MEDIUM-Btu GASIFICATION Final Report, Mar. 1976 - Mar. 1981
K. W. Lee, W. S. Seames, R. V. Collins, K. J. Bombaugh, and G. C. Page Aug. 1981 325 p refs
(Contracts EPA-68-02-3137; EPA-68-02-2147)
(PB82-114075; EPA-600/7-81-142) Avail: NTIS HC A14/MF A01 CSCL 13B

An environmental data acquisition program involving a commercial scale, medium Btu, Lurgi gasification plant in the Kosovo region of Yugoslavia is described. The objective of the program was to characterize potential environmental problems

associated with coal gasification in a Lurgi plant. The primary conclusion of the environmental assessment mode is that the process exhibits a significant potential for pollution. All discharge streams are potential vehicles for pollutant transfer from the process to the environment. The streams with the highest priority for control based on their potential for adverse health effects in the three discharge media, are the H2S rich waste gas, phenolic wastewater, and heavy tar. GRA

N82-18752# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.

TESTING AND ANALYSIS OF A WET-DRY CROSSFLOW COOLING TOWER. VOLUME 1: TEST PROGRAM AND RESULTS Final Report, Jul. 1977 - May 1981

D. L. Ayers, M. R. Hogan, A. E. Hibar, and R. A. Lucheta Jul. 1981 186 p refs Prepared in cooperation with Tennessee Valley Authority, Chattanooga

(PB82-103771; TVA/OP/EDT-81/47A-Vol-1; EPA-600/7-81-106A-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 13A

The test program and performance analysis of a single cell mechanical draft wet/dry cooling tower are discussed. Performance data and results on mass transfer, heat transfer, fluid flow plume formation, and acoustic characteristics for comparison with models/theories were obtained. Correlations are presented for the wet fill mass transfer coefficient, wet fill water loss, Colburn j-factor for the finned tubes, and fan efficiency of the following water loading in the tubes, air loading over the fins, log mean humidity difference, outlet water temperature, Reynolds number, and air flow rate. Acoustic data are fitted to a series of curves for each of the eight octave bands. GRA

N82-18753# TRW, Inc., Redondo Beach, Calif. Environmental Engineering Div.

EMISSIONS ASSESSMENT OF CONVENTIONAL STATIONARY COMBUSTION SYSTEMS: SUMMARY REPORT Final Report, Sep. 1976 - Jul. 1981

C. C. Shih and A. M. Takata Sep. 1981 77 p refs

(Contract EPA-68-02-2197)

(PB82-109414; EPA-600/7-81-003D) Avail: NTIS HC A05/MF A01 CSCL 13B

Results of a characterization of multi-media emissions from 39 source categories of conventional stationary combustion systems are reported. In the assessment, existing emissions data were first examined to determine the adequacy of the data base. This was followed by a measurement program to fill identified data gaps. Emissions data obtained from the sampling and analysis program were combined with existing emissions data to provide estimates of emission levels, and to define the need for additional data. Study results indicate that flue gas emissions of NOx, SO2, and particulate matter from the 39 source categories account for approximately 86, 66, and 36%, respectively, of the emissions of these pollutants from all stationary sources. Additionally, flue gas emissions of sulfates and several trace elements from coal- and oil-fired combustion sources also require further attention. GRA

N82-18754# NATO Committee on the Challenges of Modern Society, Brussels (Belgium).

NATO/CCMS PILOT STUDY ON DISPOSAL OF HAZARDOUS WASTES, PHASES 1 AND 2 Final Report

Apr. 1981 71 p refs

(PB82-114562; NATO/CCMS-122) Avail: NTIS HC A04/MF A01 CSCL 13B

The objectives of the pilot study are defined as follows: (1) to define and analyze technical, organizational and regulating ways and means for the proper disposal of hazardous wastes, (2) to compile and evaluate various management approaches to the solution of the hazardous waste problem, and (3) to draw conclusions from the previous analysis and work out recommendations where possible. The conclusion, after seven years of intensive work, is that the pilot study is thus far the most comprehensive and effective international effort in the area of hazardous waste management. Author (GRA)

N82-18755# Florida Univ., Gainesville. Water Resources Research Center.

EFFECT OF OXIDATION OF SOIL ORGANIC MATTER ON WATER QUALITY: ROLE OF NITRIFICATION AND DENITRIFICATION

Robert L. Tate, III and Richard E. Terry Apr. 1981 94 p refs (Contract DI-14-34-0001-9063;OWRT Proj. B-041-FLA)

(PB82-103946; W81-05354; OWRT-B-041-FLA(2)) Avail: NTIS HC A05/MF A01 CSCL 08M

Since mineral nitrogen produced in Histosols has a significant effect on regional water quality, nitrification and denitrification and the effect of the physical and chemical environment on these reactions were studied in Pahokee muck, a drained Histosol. Highest potential denitrification rates were detected in cultivated fields. These rates were about 3-fold that of a soil from a fallow field. Nitrite accumulated in low concentrations in the soils as a result of denitrification. Denitrification was limited by carbon in uncultivated soils, but not in the soils from the sugarcane or grass fields. Oxygen was limiting to denitrification in drained soils since during flooding the denitrification capacity and denitrification populations increased, while soil nitrate levels decreased about 80 percent. GRA

N82-18756# Mason and Hanger-Silas Mason Co., Inc., Leonardo, N. J.

PERFORMANCE TESTING OF FOUR SKIMMING SYSTEMS Final Report

Henry W. Lichte, Michael K. Breslin, Gary F. Smith, Douglas J. Graham (PA Engineering), and Robert W. Urban (PA Engineering) Sep. 1981 92 p refs

(Contract EPA-68-03-2642)

(PB82-101353; EPA-600/2-81-189) Avail: NTIS HC A05/MF A01 CSCL 13B

Performance tests were conducted at an oil and hazardous simulated environmental test tank on four commercial oil spill cleanup devices: the Sapiens Sirene skimming system, the Oil Mop remote skimmer, the Troll/Destroll skimming system, and the Versatile Bennett arctic skimmer. The objective of the test program was to evaluate skimmer performance in collecting oil floating on water using several wave conditions, tow speeds, and skimmer operating parameters. Author

N82-18757# Scott Environmental Technology, Inc., San Bernardino, Calif.

INVENTORY OF EMISSIONS FROM MARINE OPERATIONS WITHIN THE CALIFORNIA COASTAL WATERS Final Report

W. C. Kelly, L. R. Reckner, and G. D. Maines 26 Jun. 1981 222 p refs

(Contract ARB-A6-209-30)

(PB82-105099; Rept-2581-01-0681; ARB-R-81/40) Avail: NTIS HC A10/MF A01 CSCL 13B

The magnitude of air polluting emissions from marine vessels and marine related activities in the coastal waters and ports of California is studied. Major sources of emissions included the operation of marine engines and auxiliary power plants; the transport, handling, storage and transfer of petroleum and petroleum products, and the ballasting and lightering associated with tanker vessel operations. The record of activity of every commercial vessel operating in the waters of California was traced and the emissions were calculated for each activity of these vessels. The average daily emissions were - NOx 41.4 tons per day (tpd), CO 8.3 tpd, SO2 79.2 tpd, hydrocarbons 21.5 tpd, and particulates 7.6 tpd. GRA

N82-18758# General Electric Co., St. Petersburg, Fla. Energy Systems Programs Dept.

STUDY OF AUTOMATIC CONTROL SYSTEM TO MAINTAIN CONSTANT PERCENTAGE SO2 RETENTION IN A PRESSURIZED FBC Final Report, Sep. 1979 - Dec. 1980

K. J. Daniel, S. D. Finnigan, and R. M. Reinstrom Sep. 1981 174 p refs

(Contract EPA-68-02-3131)

(PB82-110693; EPA-600/7-81-154) Avail: NTIS HC A08/MF A01 CSCL 13B

The Clean Air Act amendments of 1977 indicate that future emission standards for SO2 should be based on a percentage reduction (comparing sulfur emissions with sulfur feed). In a PFB, sulfur feed (coal sulfur content, feed rate) and sulfur removal effectiveness (sorbent reactivity, feed rate) vary continually during operation. A transient model of a PFB plant was developed,

validated, and used to assess automatic control options. The preferred control option identified in the assessment would continuously monitor the sulfur content in the feed coal, and would adjust the sorbent feed rate to maintain a constant sorbent-calcium/coal-sulfur-feed ratio. Such a system would minimize, but not eliminate, the need for excess sorbent feed to ensure that the PFB did not exceed the specified percentage SO2 reduction on a 30-day average. GRA

N82-18759# Texas Dept. of Water Resources, Austin.
GROUND-WATER FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS
Donald E. White, Joseph S. Gates, James T. Smith, and Bonnie J. Fry Oct. 1980 103 p Prepared in cooperation with Geological Survey, Austin, Tex.
(PB82-105289; TDWR/R-259) Avail: NTIS CSCL 13B

Ground water data was collected in the Texas basins west of the Pecos River drainage area and northwest of the Big Bend country. The basins included are, from east to west: Presidio Bolson, Salt Basin, Green River Valley, Eagle Flat, and Red Light Draw. The data collection program consisted of an inventory of all major irrigation, municipal supply, and industrial wells; selected stock and domestic wells; and selected springs. The data covers parts of Hudspeth, Culberson, Jeff Davis, and Presidio Counties. Maps and tables show locations of wells and springs; records, including water levels; and chemical analysis.
Author (GRA)

N82-18760# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
COMPILATION OF AIR POLLUTANT EMISSION FACTORS (INCLUDING SUPPLEMENTS 1-7), SUPPLEMENT 12
Apr. 1981 192 p refs
(PB82-101213; AP-42-ED-3-Suppl-1-7/12) Avail: NTIS HC A09/MF A01 CSCL 13B

Revised or updated emissions data are presented for dry cleaning; surface coating; storage of organic liquids; solvent degreasing; graphic arts; consumer/commercial solvent use; sulfuric acid; beer making; ammonium sulfate; primary aluminum; secondary aluminum; gray iron foundries; steel foundries; secondary zinc; asphaltic concrete; and asphalt roofing. The NEDS source classification codes and emission factor listing, and table of lead emission factors are presented. GRA

N82-18761# Meteorology Research, Inc., Santa Rosa, Calif.
CHARACTERIZATION OF SCRUBBED AND UNSCRUBBED POWER PLANT PLUMES Final Report, Jun. 1980 - Apr. 1981
Gregory R. Markowski, Jeffrey L. Stith, and L. Willard Richards Jun. 1981 60 p refs
(Contract EPA-68-02-3418)
(PB82-101346; EPA-600/3-81-041) Avail: NTIS HC A04/MF A01 CSCL 13B

Airborne measurements of scrubbed and unscrubbed plumes were made under the SCRUB program. The flight program and methodology of the SCRUB program and results of the analysis of the data gathered during the flight program are presented. The analysis results cover plume chemistry, primary aerosol, aersol size distributions; and aerosol formation rates among the scrubbed and mixed plumes. Little difference was seen in photochemical aerosol and sulfate formation in the scrubbed and unscrubbed plumes. However, measurement noise and plume mixing may have obscured moderate differences. The submicron primary emissions from the scrubbed unit were only about 14 percent of those from the unscrubbed unit. GRA

N82-18762# Teknekron, Inc., Waltham, Mass.
EVALUATION OF POINT SOURCE DISPERSION MODELS Final Report
Michael T. Mills, Roger Calazza, David D. Hergert, and David A. Lynn Sep. 1981 274 p refs
(Contract EPA-68-02-3192)
(PB82-121062; EPA-450/4-81-032) Avail: NTIS HC A12/MF A01 CSCL 13B

Two Gaussian point source dispersion models were evaluated by use of hourly meteorological, air quality, and emissions data collected at four power plant monitoring networks. Two versions of the EPA CRSTER model, CRSTER (Turner) and CRSTER (Irwin), were evaluated. CRSTER (Turner) is the current EPA CRSTER Model which used the so called Pasquill-Gifford-Turner (P-G-T) dispersion curves. CRSTER (Irwin) is a modification of the model based upon Irwin's horizontal and vertical dispersion curves. These models differ only in the choice of horizontal and vertical plume dispersion coefficients (sigma (y) and sigma (z)) and wind profile coefficients. Author

N82-18763# Environmental Protection Agency, Washington, D.C. Municipal Wastewater Research Committee.
MUNICIPAL WASTEWATER: RESEARCH STRATEGY SUPPLEMENT, 1981-1985
Jul. 1981 241 p
(PB82-120106; EPA-600/9-81-032) Avail: NTIS HC A11/MF A01 CSCL 13B

The requirements for Research and Development support of Program Office activities are identified. Both short-term requirements and research responses and long-range research planning are presented. These plans are based on current perceptions of research necessary to address anticipated problems or technology needs over the next five years. T.M.

N82-18764# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
SOLAR ENERGY FOR POLLUTION CONTROL Final Report, 1 Jun. - 31 Oct. 1978
P. Overly and C. Frankling Oct. 1981 103 p refs
(Contract EPA-68-03-2567; EPA Proj. 7396)
(PB82-116658; FR-80-39/EE; EPA-600/7-81-166) Avail: NTIS HC A06/MF A01 CSCL 13B

A study was conducted to determine which existing or emerging pollution control processes are best suited to make use of solar energy input and to determine the potential benefits of such applications. Pollution control processes were matched with compatible solar energy systems, resulting in the following four combinations: anaerobic digestion/flat-plate collector; anaerobic digestion/parabolic trough concentrator; baghouse heating/parabolic trough concentrator; SOX scrubbing/parabolic trough concentrator. GRA

N82-18765# Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.
AN INVESTIGATION OF CHEMISTRY AND TOXICITY OF OZONE-PRODUCED OXIDANTS AND BROMATE TO SELECTED ESTUARINE SPECIES
Dennis T. Burton and Leonard B. Richardson May 1981 100 p refs
(Grant EPA-R-804683)
(PB82-116351; EPA-600/4-81-040) Avail: NTIS HC A05/MF A01 CSCL 13B

The chemical and biological effects of ozone in estuarine systems was determined. Its suitability as an alternative to chlorine was evaluated. Chemical studies were performed to determine oxidant decay rates and bromate formation in both natural and artificial estuarine water. Ozonation of estuarine or marine waters can produce significant amounts of bromate if the natural levels of ammonia-nitrogen and other competing compounds are low and the initial residual oxidant and bromide concentrations are high. Toxicity studies showed that the concentrations of bromate which theoretically could be formed in an ozonated discharge were not toxic to the early life stages of striped bass (Morone saxatilis) and juvenile spot (Leiostomus xanthurus). A ozone appears to offer few if any, advantages over chlorine in reducing toxicity to estuarine organisms. Author

N82-18766# PEDCo-Environmental, Inc., Cincinnati, Ohio.
EPA UTILITY FGD (FLUE GAS DESULFURIZATION) SURVEY Final Report, Apr. - Jun. 1981
M. Smith, M. Melia, N. Gregory, and R. McKibben Aug. 1981 335 p
(Contract EPA-68-02-3173)
(PB82-115858; EPA-600/7-81-012D) Avail: NTIS HC A15/MF A01 CSCL 13B

A survey of operational and planned domestic utility flue gas desulfurization (FGD) systems, operational domestic particle scrubbers, and Japanese coal-fired utility FGD installations is

presented. It summarizes information contributed by the utility industry, system and equipment suppliers, systems designers, research organizations and regulatory agencies. It presents data on system design, fuel characteristics, operating history, and actual performance. Unit by unit dependability parameters are included and problems and solutions associated with the boilers, scrubbers, and FGD systems are discussed. The domestic FDG systems are tabulated alphabetically by development status (operational, under construction, or in the planning stages), utility company, system supplier, process, waste disposal practice, and regulatory class. Author

N82-18767# Pacific Environmental Services, Inc., Santa Monica, Calif.
QUALITY ASSURANCE AUDITS FOR SIP AND NECRMP EMISSION INVENTORIES: NEW YORK AND NEW JERSEY Final Report
L. G. Wayne and J. Cassamassi Aug. 1981 100 p
(Contract EPA-68-02-3511)
(PB82-114273; EPA-902/4-81-002) Avail: NTIS HC A05/MF A01 CSCL 13B

Quality assurance audits were performed covering emission inventories for volatile organic compounds and oxides of nitrogen in the State of New Jersey and in a portion of the State of New York comprising the counties of Rockland, Westchester, Nassau, Suffolk, Bronx, New York, Queens, Kings and Richmond. Point source listings were compared with EPA's RACT directory and with State Industrial Directors to compile list of possibly missing point sources. Methodology involved in segregating point and area sources, in estimating emissions and in seasonal adjustment of the inventories to a typical summer-day basis was reviewed. Area source categories and the methodologies an apportioning factors applied to them were reviewed. Results are extensively tabulated. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-18768 California Univ., Santa Cruz.
THE ENVIRONMENTAL STRATIGRAPHY AND DEPOSITIONAL SYSTEMS OF THE PRECAMBRIAN (?)-CAMBRIAN CAMPITO FORMATION, EASTERN CALIFORNIA AND WESTERN NEVADA Ph.D. Thesis
Jeffrey Frazer Mount 1980 246 p
Avail: Univ. Microfilms Order No. 8127995

The Campito Formation is a 1300 m thick upper Precambrian(?)Lower Cambrian sequence of siliciclastic rocks that crop out extensively in western Nevada and eastern California. The formation comprises two members: the Andrews Mountain Member and the gradationally overlying Montenegro Member. The Andrews Mountain Member consists of complexely interbedded, dark-colored feldspathic quartzites, siltstones and mudstones. The Montenergro Member is composed mostly of siltstones and mudstones. The Campito lithologies reflect a complex diagenetic and metamorphic history. Most importantly, the abundant magnetite within the rock was produced by metamorphic recrystallization of a preexisting iron oxide phase, probably hematite (?) A transition analysis of the five facies and nine subfacies of the campito formation indicates that two overall depositional systems can be be described as defined by the two members. Dissert. Abstr.

N82-18769 California Univ., Santa Cruz.
SEDIMENTOLOGY AND DIAGENESIS OF BRYOZOAN AND SPONGE-RICH CARBONATE BUILDUPS GREAT BAHAMA BANK Ph.D. Thesis
Deborah Marie Bliefnick 1980 299 p
Avail: Univ. Microfilms Order No. 8123243

On the northern third of the Great Bahama Bank, bryozoans and sponges are prominant constituents (including framebuilders) of Holocene carbonate buildups. These buildups are significant because bryozoans and sponges as framebuilders. These buildups are significant because bryozoans and sponges as framebuilders, whether minor or major, have not previously been reported from the modern world. The bryozoan-rich buildups occur in the main tidal channel that dissects the Joulters Cays ooid sand shoal just north of Andros Island; eight mounds were sampled and examined. The sponge-rich buildups are scattered across the open bank, north and west of Joulters Cays; eleven sites or stations containing sponge mounds were mapped and sampled. Three main facies complexes are delineated in the Joulters Cays buildups: shelf margin, oolite shoal and coral reef. The shelf margin complex consists of two parts: a lithoclast packstone facies and a peloid-foram grainstone facies. The oolite shoal complex is dominated by oomoldic and oolitic grainstones. The coral reef facies complex consists mainly of Porites and Montastrea coral boundstone with lesser amounts of Celleporariid bryozoan and lithothamnioid boundstones. Dissert. Abstr.

N82-18770*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE STRATOSPHERE 1981: THEORY AND MEASUREMENTS
Jan. 1982 514 p refs Workshop on the state of the stratosphere, Hampton, Va., 18-22 May 1981 Sponsored in part by the WMO, FAA, NOAA and UN Environment Program
(NASA-TM-84125; Rept-11) Avail: NTIS HC A22/MF A01 CSCL 04A

Measurements of trace species are compared with theoretical estimates and the similarities and the differences between the two sets of data are discussed. The theoretical predictions are compared with long term trends in both column content and altitude profile of ozone as observed from ground-based and satellite instruments. The chemical kinetics and photochemistry of the stratosphere were reviewed. For individual titles, see N82-18771 through N82-18777.

N82-18771*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRACE SPECIES
In its The Stratosphere 1981 Jan. 1982 185 p refs (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

Tropospheric and stratospheric source gases and their distribution are reported. A comparison of measurements and model calculations for stratospheric gases is presented. T.M.

N82-18772*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTIDIMENSIONAL ASPECTS: OZONE, TEMPERATURE AND TRANSPORT
In its The Stratosphere 1981 Jan. 1982 99 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

The capability for obtaining four-dimensional data on stratospheric structure, dynamics, and zone is discussed. Progress in the development of multidimensional models of the stratosphere is reported. The discussion of multidimensional aspects of the stratosphere is divided into four major sections: observations, analysis and interpretation, modeling, and transport of trace species. T.M.

N82-18773*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODEL PREDICTIONS AND TREND ANALYSIS
In its The Stratosphere 1981 Jan. 1982 56 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

Individual perturbations in atmospheric models are discussed. These are hypothetical perturbations determined by model computation in which it is assumed that one particular input or set of inputs to the model is changed while all others are held constant. The best estimates of past time dependent variations of globally averaged total ozone, and upper tropospheric and stratospheric ozone were determined along with geographical differences in the variations. T.M.

N82-18774*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHEMICAL KINETICS AND PHOTOCHEMISTRY

In its The Stratosphere 1981 Jan. 1982 31 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

A compilation of rate constant data for use in stratospheric modeling is presented. The tabulations are divided into two categories: bimolecular and termolecular. Explanations are given for anomalous pressure and temperature dependences. T.M.

N82-18775*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A REFERENCE SOLAR SPECTRAL IRRADIANCE FOR USE IN ATMOSPHERIC MODELING
In its The Stratosphere 1981 Jan. 1982 13 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

The present state of knowledge concerning the absolute magnitude and temporal variability of the solar spectral irradiance is outlined with emphasis on wavelengths relevant to the mesosphere and stratosphere. Reference spectra for the wavelength region 175 to 850 nm are presented including estimates for solar maximum and solar minimum conditions. Values for the Lyman alpha emission are given separately. T.M.

N82-18776*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC INSTRUMENTS AND ANALYSES
In its The Stratosphere 1981 Jan. 1982 26 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

The Instruments are divided into two groups, ground based instruments and satellite-borne instruments. The ground based instruments include a Dobson ozone spectrophotometer, a filter ozonometer, and ozonesondes. The satellite-borne instruments include: a backscatter ultraviolet spectrometer, a high resolution infrared radiation sounder, a infrared interferometer spectrometer, a limb radiance inversion radiometer, and multichannel filter radiometer. A list of investigations using stratospheric satellite data is presented. T.M.

N82-18777*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC AEROSOLS AND PRECURSOR GASES
In its The Stratosphere 1981 Jan. 1982 12 p (For primary document see N82-18770 09-46)
Avail: NTIS HC A22/MF A01 CSCL 04A

Measurements were made of the aerosol size, height and geographical distribution, their composition and optical properties, and their temporal variation with season and following large volcanic eruptions. Sulfur-bearing gases were measured in situ in the stratosphere, and studied of the chemical and physical processes which control gas-to-particle conversion were carried out in the laboratory. T.M.

N82-18778# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IONOSPHERIC PROGRAM [PROGRAMA DE IONOSFERA]
M. A. Abdu Jun. 1981 20 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Aeronomy Workshop, Brazil-Argentina, Foz do Iguacu, Brazil, 18-20 Jun. 1981
(INPE-2113-RPE/337) Avail: NTIS HC A02/MF A01

This report describes the research areas and activities, experimental and theoretical, of the ionospheric program in INPE. Also included are the publications by the ionospheric group in the last two years. Author

N82-18779# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SIMULATION OF EQUATORIAL PLASMA BUBBLE SIGNATURES ON THE OI 6300 A NIGHTGLOW MERIDIONAL PROFILE OVER BRAZILIAN LOW LATITUDE
Y. Nakamura, J. H. A. Sobral, and M. A. Abdu Nov. 1981 23 p refs Submitted for publication
(INPE-2260-PRE/042) Avail: NTIS HC A02/MF A01

The [OI] 6300 A nightglow emission measurements carried out by scanning photometers over Cachoeira Paulista show propagating disturbances of the meridional and east-west intensity profiles. The disturbances propagate from north to south and from west to east. It is shown that these disturbances are closely correlated with the occurrence of spread F irregularities observed by ionosonde. Airglow intensity was calculated as a function of zenith angle in the photometer scanning range using electron density profiles perturbed by field aligned plasma bubble, whose vertical velocity and electron density depletion profile were determined from a numerical simulation of the nonlinear Rayleigh Taylor instability under ionospheric conditions that best represented those of the observing period and location. The result shows that, as the field aligned plasma bubbles rises up over the equator, their extremities trace out poleward motion in the low latitude ionosphere which could explain the observed north to south propagation of the airglow intensity valleys. J.M.S.

N82-18780# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EQUATORIAL SPREAD F INSTABILITY CONDITIONS AS DETERMINED FROM IONOGRAMS
M. A. Adbu, R. T. deMedetros, and J. H. A. Sobral Jan. 1982 12 p refs Sponsored in part by FNDCT
(INPE-2310-PRE/075) Avail: NTIS HC A02/MF A01

Conditions of plasma irregularity (or Spread F) generation under the Rayleigh-Taylor instability mechanism in the nighttime equatorial ionosphere are examined from ionogram data registered over Fortaleza (4 deg S, 38 deg W, mag. dip lat. - 1.7 deg) Brazil for a one year period. The results show that local ionospheric conditions such as the bottomside F region electron density scale length and the ion neutral collision frequency at the base of the layer, at sunset hours, determine the generation of the spread F irregularities over the equator in the post sunset hours. Author

N82-18781# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
H2O MASER SURVEY IN THE MAGNELLANIC CLOUDS
E. Scalise, Jr. and M. A. Braz (Conselho Nacional de Desenvolimento Cientifico e Technologico, San Paulo, Brazil) Nov. 1981 16 p refs Submitted for publication Sponsored in part by FINEP
(INPE-2279-PRE/057) Avail: NTIS HC A02/MF A01

An extensive search for was water vapor maser emission towards the Large and Small Magellanic Clouds is reported. The 6 sub 16 to 5 sub 23 transition of water molecular was detected in two H II regions in LMC (including N159, previously detected) and in two H II regions in SMC. A total of 32 positions was searched in both clouds. The strength of the sources detected are comparable with galactic masers with luminosities L approximately < 0.01 solar L. Author

N82-18782# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THEORETICAL ANALYSIS OF THE REAL AND APPARENT VELOCITIES OF VERTICAL PLASMA DRIFT IN THE EQUATORIAL IONOSPHERE [UMA ANALISE TEORICA DAS VELOCIDADES REAL E APARENTE DE DERIVA VERTICAL DO PLASMA NA IONOSFERA EQUATORIAL]
J. A. Bittencourt and M. A. Abdu Jun. 1981 11 p refs In PORTUGUESE; ENGLISH abstract Presented at the the 33rd Ann. Meeting of SBPC, Salvador-Bahie, Brazil, 8-15 Jul. 1981
(INPE-2143-RPE/365) Avail: NTIS HC A02/MF A01

A theoretical analysis of the distribution of ionization in the low latitude ionosphere, as a function of local time, is presented, using a computer model of the tropical F-region, with special interest in the vertical motions of the ionization. It is shown that during periods, especially after sunset, when the F-layer height is above about 300 km, the apparent vertical displacement velocity of the ionization, determined from ionograms, is the same as the E x B vertical drift velocity, measured from incoherent backscatter radar. Author

N82-18783# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CHARACTERISTICS OF THE 6300 ANGSTROM OI LUMINESCENCE AT A LOW LATITUDE AMERICAN SECTOR [CARACTERISTICAS DA LUMINESCENCIA OI 6300 A EM BAIXA LATITUDE NO SETOR AMERICANO]
Carlos Jose Zamlutti and Jose Humberto Andrade Sobral Jun. 1981 10 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981

(INPE-2114-RPE/338) Avail: NTIS HC A02/MF A01

The intensity of the nightglow at Cachoeira Paulista has a typical signature within the meridional plane during the pre-midnight period. An analysis of extensive measurements at this site reveals oscillations in the nightglow intensity, which perhaps can be explained by ionization transport. Author

N82-18784# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARATIVE STUDY OF THE ELECTRONIC DENSITY PEAK AND PEAK HEIGHT OF THE F SUB 2 LAYER CALCULATED BY CCIR AND OBSERVED BY CACHOEIRA PAULISTA AND FORTALEZA FOR MAGNETICALLY CALM PERIODS [ESTUDO COMPARATIVO DO PICO DE DENSIDADE ELECTRONICA E DA ALTURA DO PICO DA CAMADA F2 CALCULADOS PELO CCIR E OBSERVADOS PARA CACHOEIRA PAULISTA E FORTALEZA, PARA PERIODOS MAGNETICAMENTE CALMOS]

Eurico Rodrigues dePaula, Ivan Jelinek Kantor, and Mangalathayil Ali Abdu Jun. 1981 15 p refs Presented at the 33rd Ann. Meeting of SBPC, Salvador-Bahia, Brazil, 8-15 Jul. 1981

(INPE-2144-RPE/366) Avail: NTIS HC A02/MF A01

The critical frequency for region F, foF2, and the maximum electron density height, hmF2, predicted by the CCIR model are compared with observed values obtained by ionosondes for March, June, September and December, 1978. The same comparison was also made for the undisturbed days. A better approximation between predicted and observed values for the undisturbed period was observed in the interval of 3 pm to midnight. From midnight to 5 am an inverse trend was observed. Between 5 am and 3 pm the differences were negligible. The diurnal average does not show any improvement between predicted and observed values for the undisturbed days. T.M.

N82-18785# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

HIGH ALTITUDE ATMOSPHERIC PHYSICS PROGRAM [PROGRAMA DE FISICA DA ALTA ATMOSFERICA]

Barclay Robert Clemesha Jun. 1981 16 p refs In PORTUGUESE; ENGLISH summary Presented at the 1st Aeronomy Workshop, Brazil-Argentina, Foz do Iguacu, Brazil, 18-20 Jun. 1981

(INPE-2111-RPE/336) Avail: NTIS HC A02/MF A01

Investigations into the composition, photochemistry, and dynamics of the stratosphere, mesosphere, and thermosphere are described. Programs in laser radar observation, atmospheric luminescence, the equatorial aurora, data acquisition, meteorological radar, and Fabry-Perot interferometry are discussed. The experimental program, interpretation of results, and theoretical studies are described. J.D.H.

N82-18786*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

REPORTS ON CRUSTAL MOVEMENTS AND DEFORMATIONS

Steven C. Cohen and Tim Peck Dec. 1981 141 p

(NASA-TM-83872) Avail: NTIS HC A07/MF A01 CSCL 08G

Studies of tectonic plate motions, regional crustal deformations, strain accumulation and release, deformations associated with earthquakes and fault motion, and micro-plate motion, were collected and are summarized. To a limited extent, papers dealing with global models of current plate motions and crustal stress are included. The data base is restricted to articles appearing in reveiwed technical journals during the years 1970-1980. The major journals searched include: Journal of Geophysical Research (solid earth), Tectonophysics, Bulletin of the Seismological Society of America, Geological Society of America Bulletin, Geophysical Journal of the Royal Astronomical Society, and the Journal of Geology. T.M.

N82-18787*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A COMPLETE X-RAY SAMPLE OF THE HIGH LATITUDE SKY FROM HEAO-1 A-2: log N lo S AND LUMINOSITY FUNCTIONS

G. Piccinotti, R. F. Mushotzky, E. A. Boldt, S. S. Holt, F. E. Marshall, P. J. Serlemitsos, and R. A. Shafer Aug. 1981 51 p refs Submitted for publication

(NASA-TM-82168) Avail: NTIS HC A04/MF A01 CSCL 04A

An experiment was performed in which a complete X-ray survey of the 8.2 steradians of the sky at galactic latitudes where the absolute value of b is > 20 deg down to a limiting sensitivity of < 3.1 x ten to the minus 11th power ergs/sq cm sec in the 2-10 keV band. Of the 85 detected sources 17 were identified with galactic objects, 61 were identified with extragalactic objects, and 7 remain unidentified. The log N - log S relation for the non-galactic objects is well fit by the Euclidean relationship. The X-ray spectra of these objects were used to construct log N - log S in physical units. The complete sample of identified sources was used to construct X-ray luminosity functions, using the absolute maximum likelihood method, for clusters galaxies and active galactic nuclei. M.D.K.

N82-18788# R and D Associates, Marina Del Rey, Calif.

SOIL PROPERTIES OF USSR STRATEGIC AREAS. VOLUME 1: SOIL PROPERTY COMPARISONS FOR SELECTED USSR AND U.S. SOILS Topical Report, 5 Jan. - 1 Dec. 1980

Deane Oberste-Lehn Washington DNA 1 Dec. 1980 113 p refs

(Contract DNA001-80-C-0069)

(AD-A108743; RDA-TR-113206-003-Vol-1; DNA-5701T-1) Avail: NTIS HC A06/MF A01 CSCL 08/7

Soils of USSR strategic areas and the MIDDLE GUST test site were compared to evaluate the validity of using MIDDLE GUST geology as representative of radiation energy absorption for USSR strategic areas. Average Z values were calculated for the USSR and MIDDLE GUST soils using weight and adjusted volumetric methods. Results indicate that porosity and pore water content cause greater variation in the average Z values of these soils than does the mineralogic component, and that method of calculation causes significant differences. To verify the validity of using the MIDDLE GUST test site for radiation energy absorption calculations of USSR strategic areas, it is recommended that the computer codes use the volumetric (not weight) calculation method and that the vegetation in the USSR areas be assessed for its effect on energy coupling into the ground. Author (GRA)

N82-18789# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.

THE GLOBAL Pc 5 EVENT OF 14-15 NOVEMBER 1979

J. F. Fennell, J. R. Ashbridge, D. N. Baker, R. D. Belian, P. R. Higbie, R. D. Zwickl, B. Wilken, and C. W. Arthur 1 Oct. 1981 43 p refs Prepared in cooperation with LASL and Colorado Univ., Boulder

(Contract F04701-81-C-0082)

(AD-A108143; TR-0082(2940-05)-5; SD-TR-81-74) Avail: NTIS HC A03/MF A01 CSCL 04/1

Large amplitude Pc-5 waves with 7-8 minute quasi-periodic variations were observed almost continuously for the forty-eight hours of November 14-15, 1979 by several spacecraft in or near geostationary orbit on the day-side portions of their orbits. The waves were observed as large modulations in both the electron and ion fluxes over a wide range of energies (approximately 1 to 500 keV) by the spacecraft 1976-059, 1977-007, 1979-053, P78-2, and GEOS-2 and as magnetic field peak-to-peak modulations of 15-25 gamma by the P78-2 and GOES-2 and -3 magnetometers. The remarkably long persistence of these waves contrasts substantially with observations of typical flux modulation events which usually last less than one hour and which typically show little modulation of the greater or less than 150 keV proton fluxes. GRA

N82-18790# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Applied Research Branch.

SITE INVESTIGATIONS AND SUBMARINE SOIL MECHANICS IN POLAR REGIONS

Edwin J. Chamberlain Oct. 1981 20 p refs Sponsored in part by Geological Survey

(AD-A108269; CRREL-SR-81-24) Avail: NTIS HC A02/MF A01 CSCL 08/13

Placing oil exploration and production structures offshore in

the Alaskan Beaufort Sea will require careful site investigation and evaluation of submarine soil mechanics. Ice-bonded permafrost occurs widely under the Beaufort Sea floor. Its engineering properties are important to the design of offshore structures. Highly overconsolidated clays also occur widely and interfere with access to gravels for constructing artificial islands. Sites should be selected to avoid ice-rich permafrost. Laboratory tests may need to be conducted to determine the potential hazards of thaw consolidation and weakening. GRA

N82-18791# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROFESSOR M. M. PROTODYAKONOVS STRENGTH COEFFICIENT F OF ROCKS
12 Nov. 1981 40 p Transl. into ENGLISH from the mono. "Voprosy Razrusheniya i Davleniya Gornykh Porod, Ugletekhizdat" Moscow, 1955 p 42-55
(AD-A108209; FTD-ID(RS)T-1293-81) Avail: NTIS HC A03/MF A01 CSCL 08/9

The mechanical properties of rocks play a primary role in mining. The selection of extraction methods, the productivity of a certain method of extraction, the behavior of the roof, and other elements are dependent upon rock mechanics. The development of rock strength coefficients is summarized. T.M.

N82-18792# Northeastern Univ., Boston, Mass. Electronics Research Lab.
DESIGN OF SOUNDING ROCKET PAYLOADS Final Report, 1 May 1976 - 30 Apr. 1981
Richard L. Morin and Lawrence J. OConnor 1 Jul. 1981 72 p refs
(Contract F19628-76-C-0152; AF Proj. 7659)
(AD-A108271; AFGL-TR-81-0235) Avail: NTIS HC A04/MF A01 CSCL 19/7

This report is a summary of work accomplished from 1 May 1976 to 30 April 1981. Contract efforts were in the design, fabrication, testing, and launch support of sounding rocket payloads and related ground support equipment. Specific areas of work related to this report include: payload structures, component packaging, deployment and eject mechanisms, diagnostic components, in-flight sequencing, power systems and control consoles. Also described are electrical and mechanical interfaces with experiments, telemetry systems, attitude control systems, recovery systems and other payload subsystems. GRA

N82-18793# California Univ., Berkeley. Dept. of Geology and Geophysics.
STATE-OF-THE-ART FOR ASSESSING EARTHQUAKE HAZARDS IN THE UNITED STATES. INTERPRETATION OF STRONG GROUND MOTION RECORDS
Bruce A. Bolt Oct. 1981 219 p refs
(Contract DACW39-78-C-0061)
(AD-A108615; WES-MP-S-73-1-17; Rept-17) Avail: NTIS HC A10/MF A01 CSCL 08/11

The main patterns of motions recorded on accelerograms near to the causative fault are described in terms of P and S waves and Love and Rayleigh waves. In order to achieve this, the effects of source dimensions and the physical and kinematic properties of the fault zone are included in the analysis. The two main aims of the work were, first, to make an initial step toward the routine interpretation of the recorded strong ground motions and, as a consequence, to provide a basis which would allow ground motions in future large earthquakes to be predicted. Both aspects of strong -motion seismology are of interest to the engineering profession for the design of critical structures in earthquake country. The research has been based on the detailed study of near-field records obtained in moderate to large earthquakes in the last few decades. Author

N82-18794# Alaska Univ., Fairbanks. Geophysical Inst.
IONOSPHERE RESEARCH Final Report
Robert Hunsucker and Robert Freyman (LASL) 12 Nov. 1981 8 p refs
(Contract DASG60-80-C-0047)
(AD-A108905) Avail: NTIS HC A02/MF A01 CSCL 20/14

The aim of the contract between BMC/ATC and the Geophysical Institute of the University of Alaska (GI/UAF) has been to provide support for Mr. Robert Freyman of Los Alamos National Laboratories (LANL) to conduct investigations of the long-delay-echo (LDE) phenomenon at field sites in the auroral zone. GRA

N82-18795# Chicago Univ., Ill. Dept. of Geophysical Sciences.
AN EXPLICIT METHOD OF SOLUTION OF THE GEOMAGNETIC INDUCTION PROBLEM
Victor Barcilon Nov. 1981 22 p refs
(Contract N00014-76-C-0034; NR Proj. 041-476)
(AD-A109369) Avail: NTIS HC A02/MF A01 CSCL 08/7

The problem of inferring the Earth conductivity as a function of depth from surface measurements of the magnetic field is considered. Two versions of a method analogous to that of Bailey (1970) are presented. The main feature of the method consists in the fact that the conductivity is given explicitly in terms to two auxiliary sequences of functions which are found by integrating a set of first order nonlinear differential equations. Author (GRA)

N82-18796# European Space Agency, Paris (France).
METHODS FOR INTERPRETING ATMOSPHERIC SPECTRAL OBSERVATIONS BY SUN SIGHTING THROUGH THE EARTH LIMB Ph.D. Thesis - Paris. 6 Univ.
Gerard Eichen Nov. 1981 94 p refs Transl. into ENGLISH from "Methodes d'Interpretation d'Observations Spectrales Atmospheriques Effectuees par Visee au Soleil a travers le Limbe Terrestre", Rept. ONERA-NT-1981-2, Paris, 1981 Original report in FRENCH previously announced as N81-27739
(ESA-TT-715; ONERA-NT-1981-2) Avail: NTIS HC A05/NF A01

Measurements of absorption line areas are compared to each other and given examples, e.g. the reconstruction of NO2 profiles. Preference is given to an iterative method which makes the final solution largely independent of the initial vertical profile. A method entirely based on the calculation of synthetic spectra was studied from a theoretical viewpoint. Results of simulated observations assuming nine spectra without noise show that the profile can be recovered even with a zero initial profile. White noise does not affect results significantly. The ability to treat large numbers of spectra suits the method to Spacelab experiments. Author (ESA)

N82-18797# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
THE PROPERTIES OF IONOSPHERIC SINGLY IONIZED OXYGEN IONS AS OBSERVED IN THE MAGNETOTAIL BOUNDARY LAYER AND NORTHERN PLASMA LOBE
M. Candidi, S. Orsini, and V. Formisano (ESTEC, Noordwijk, Netherlands) Jun. 1981 34 p refs Submitted for publication (IPS-81-11) Avail: NTIS HC A03/MF A01

The singly ionized oxygen ion beams flowing in the geomagnetic tail low latitude boundary layer and northern plasma lobe were investigated, using the ISEE-2 positive ion experiment. The data analysis shows that the ion velocity gradually increases from the center to the outer regions of the magnetotail, whereas the plasma density decreases the farther one moves away from the center. The temperature of the beaming ions is shown to be anisotropic with respect to the ambient magnetic field. The results clearly identify the E x B filter as the organizer of the flow of these ions after their initial acceleration in the topside ionosphere. Indications are that the acceleration mechanism is a combination of both electrostatic fields parallel to B and resonance with ion cyclotron waves. Author (ESA)

N82-18798# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
ANALYSIS OF GUST STRUCTURE IN THE ATMOSPHERIC BOUNDARY LAYER BY USING CONDITIONAL SAMPLING
Magnus Linde 10 Jun. 1981 29 p refs
(Contracts NE-5061-013; NE-5061-014)
(FFA-TN-HU-2262-Pt-1; ISSN-0081-5640) Avail: NTIS HC A03/MF A01

A conditional sampling scheme used to detect events characterized by a high level of short time variance is assessed for use in detecting gusts. The conditionally sampled average of the longitudinal velocity component exhibits a typical structure, a gust. This structure is similar to the bursts in turbulent boundary layers. The frequency of occurrence and the time scale

of the gusts are determined by the same variables as the bursts, i.e., the outer variables free stream velocity and surface layer thickness. The technique was compared with wind measurements carried out at a fixed point. The structure and frequency of gusts are predicted accurately. Author (ESA)

N82-18799# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo. World Data Center A for Solid Earth Geophysics.
CATALOG OF SIGNIFICANT EARTHQUAKES, 2000 B.C. - 1979: INCLUDING QUANTITATIVE CASUALTIES AND DAMAGE
Robert A. Ganse and John B. Nelson Jul. 1981 164 p refs (PB82-117425; NOAA-81082703; SE-27) Avail: NTIS HC A08/MF A01 CSCL 08K

The Significant Earthquake Catalog includes events from available sources that meet the following criteria: moderate damage or at least 10 deaths, of magnitude 7.5 or greater. For events lacking magnitude, intensity X or greater is the criterion. Many lesser events are also included. The catalog consists of some 2,484 events drawn from more than 100 different sources. The events range in date from 2,000 B.C. through 1979. It lists the following seismological parameters for each event: time, deaths, latitude and longitude, damage, class, depth, references, magnitude/intensity, and geographic location. When a substantial portion of the damage is noted to be associated with a tsunami, the word 'tsunami' is placed in the location column. GRA

N82-18800# Geological Survey, Reston, Va.
ENVIRONMENTAL GEOLOGIC STUDIES ON THE SOUTHEASTERN ATLANTIC OUTER CONTINENTAL SHELF, 1977-1978 Final Open File Report
Peter Popenoe, ed. 1981 435 p refs
(Contract DI-AA551-MU8-13)
(PB82-109265; OPEN-FILE-81-582-A; BLM/YN/SR-81/02)
Avail: NTIS HC A19/MF A01 CSCL 08G

The methods, techniques, instruments, and procedures utilized in accomplishing the study are summarized. The objectives were: (1) to determine the sedimentation rates and processes on the upper slope and inner Blake Plateau; (2) to determine the distribution, areal extent, and nature of geological features supportive of biological communities; (3) to monitor the transport of bottom sediments across the (OCS) Outer Continental Shelf; (4) to determine the concentration levels of chosen trace metals and silica; (5) to study the shelf edge and slope near areas of oil and gas interest; and (6) to determine the depth and rate of sediment mixing. Detailed results are given. GRA

N82-18238*# Centre National de la Recherche Scientifique, Paris (France). Service d'Aeronomie.
INVESTIGATION ON ATMOSPHERIC H AND D THROUGH THE MEASUREMENT OF THEIR LYMAN-ALPHA EMISSIONS
J. L. Bertaux *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

N82-18241*# Tokyo Univ. (Japan).
SPACE EXPERIMENTS WITH PARTICLE ACCELERATORS
Tatsuzo Obayashi *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

N82-18243*# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Labs.
ATMOSPHERIC EMISSION PHOTOMETRIC IMAGING
S. B. Mende *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

N82-18244*# Max-Planck-Institut fuer Aeronomie, Hanover (West Germany).
LOW-ENERGY ELECTRON FLUX AND ITS REACTION TO ACTIVE EXPERIMENTATION OF SPACELAB
K. Wilhelm *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 04A

N82-18245*# Oesterreichische Akademie der Wissenschaften, Vienna. Space Research Inst.
DC-MAGNETIC FIELD VECTOR MEASUREMENT
R. Schmidt *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 08N

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-18801 Texas A&M Univ., College Station.
PRECIPITATION FIELD AND INTRASTORM FLOW OF SUPERCELL CONVECTIVE STORMS Ph.D. Thesis
Daniel James McMorrow 1981 283 p
Avail: Univ. Microfilms Order No. 8128911

Single-Doppler radar data, when supplemented by surface and upper-air information, provides good estimates of the intrastorm kinematic structure of supercell storms. Spatially derived fields of radial velocity, defined as radial stretching and cross-beam shear, can be used to identify and track major intrastorm kinematic features. These fields can be computed quickly and require neither storm motion information nor a favorable beam-flow alignment. Changes in surface precipitation rates, from isolated and squall line supercells, are reflected in changes in the intrastorm flow inferred from single-Doppler data. Temporal changes in supercell kinematic structure are related to changes in surface rainfall rates. Supercell rainfall in several different environments are presented. The results suggest that changes in surface rainfall rates are related to changes in intrastorm kinematic flow.
Dissert. Abstr.

N82-18802 California Univ., Berkeley.
A THREE-DIMENSIONAL WIND MODEL FOR COMPLEX TERRAIN Ph.D. Thesis
Mark Alan Yocke 1981 251 p
Avail: Univ. Microfilms Order No. 8200313

The development, implementation, and application of a three dimensional, complex-terrain wind model are presented. The model is based on the equation of mass continuity and it employs different schemes to parameterize various physical processes that are included in the model's convergence-divergence term. The model equation is written in a conventional Poisson form and then solved numerically using a five-point difference approximation with an iterative solution procedure. To assess its performance, this model was applied to five complex-terrain situations reveal that the model produced acceptable results, especially considering the uncertainties in wind measurements. Futhermore, the model exhibits no significant tendencies toward overprediction or underprediction. Dissert. Abstr

N82-18803*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
AIRCRAFT MEASUREMENTS AND ANALYSIS OF SEVERE STORMS: 1976 FIELD EXPERIMENT Final Report
P. C. Sinclair Feb. 1982 101 p refs
(Grant NsG-5105)
(NASA-CR-168519) Avail: NTIS HC A06/MF A01 CSCL 04B

Severe storm aircraft measurements are documented, as well as the instrumentation and operational features of aircraft mobility capabilities. The measurements and data analyses indicate that the concept of a highly mobile research aircraft capability for obtaining detailed measurements of wind, temperature, moisture, spherics, etc., near and within severe storm systems, forecast 48 hours in advance in a 1000 nm operating radius, is feasible, and was successfully demonstrated. The measurements and analyses reveal several severe storm features and insights with respect to storm air flow circulations and inflow-outflow

orientation. Precipitation downdraft air is recirculated back into the updraft core below the scud cloud in both back and front feeder type storms. In a back feeder type storm, the downdraft outflow air ahead of the storm is also recirculated back into the updraft region near cloud base. S.L.

N82-18804# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CONVECTIVE RAINFALL ESTIMATION IN RIO GRANDE DO SUL STATE, BRAZIL: PRELIMINARY RESULTS
Nelson Jesus Ferreira and Leroy E. Spade (National Earth Satellite Service) Nov. 1981 20 p refs
(INPE-2271-RPE/400) Avail: NTIS HC A02/MF A01

Using the Scofield/Oliver technique, convective rainfall estimation was done for five stations, in Rio Grande do Sul State, Brazil. The preliminary results show that this method can be successfully used to estimate convective rainfall in southern Brazil. S.L.

N82-18805# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE USE OF ENVIRONMENTAL SATELLITES FOR FROST MONITORING [O USO DE SATELITES AMBIENTAIS PARA MONITORAMENTO DE GEDAS]
Luiz Carlos Baldicero Molion, Nelson Jesus Ferreira, and Luiz Bylvan meira Filho Jun. 1981 17 p refs In PORTUGUESE; ENGLISH summary Presented at 11th Congr. de Engenharia Agricola, Brasilia, Brazil, 22-27 1981
(INPE-2128-RPE/352) Avail: NTIS HC A02/MF A01

Frost is a hazardous phenomenon for most crops in southern Brazil. A review of the use of remote sensors onboard environmental satellites is presented. Emphasis is given to automatic evaluation of the affected area and to the possibility of short range forecasts two to three hours in advance. J.D.H.

N82-18806# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE EVOLUTION OF METEOROLOGICAL FORECASTING [A EVOLUCAO DE PREVISAO METEOROLOGICA]
Marco A. M. Lemes Jul. 1981 5 p refs In PORTUGUESE; ENGLISH abstract Presented at the 2nd Brazilian Congr. on Agrometeorol. Pelotas, RS, Brazil, 5-10 Jul. 1981
(INPE-2151-RPE/372) Avail: NTIS HC A02/MF A01

A survey of the evolution of the weather forecasting techniques is traced since the beginning of the century, up to the present. Meteorological services which rely on numerical methods and a massive amount of non-conventional data furnished by the meteorological satellites are highlighted. Applications to agriculture are discussed. T.M.

N82-18807*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WINTER AND SUMMER SIMULATIONS WITH THE GLAS CLIMATE MODEL
J. Shukla, D. Straus, D. Randall, Y. Sud, and L. Marx (Sigma Data Services Corp.) Dec. 1981 275 p refs Submitted for publication
(NASA-TM-83866) Avail: NTIS HC A12/MF A01 CSCL 04B

The GLAS climate model is a general circulation model based on the primitive equations in sigma coordinates on a global domain in the presence of orography. The model incorporates parameterizations of the effects of radiation, convection, large scale latent heat release, turbulent and boundary layer fluxes, and ground hydrology. Winter and summer simulations were carried out with this model, and the resulting data are compared to observations. Author

N82-18808*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CLIMATE OBSERVING SYSTEM STUDIES: AN ELEMENT OF THE NASA CLIMATE RESEARCH PROGRAM: WORKSHOP REPORT
Sep. 1980 154 p refs
(NASA-TM-84040) Avail: NTIS HC A08/MF A01 CSCL 04B

Plans for NASA's efforts in climatology were discussed. Targets for a comprehensive observing system for the early 1990's were considered. A program to provide useful data in the near and mid-term, and a program to provide for a feasibility assessment of instruments and methods for the development of a long-term system were discussed. Climate parameters that cannot be measured from space were identified. Long-term calibration, intercomparison, standards, and ground truth were discussed. R.J.F.

N82-18809# Raytheon Co., Wayland, Mass. Equipment Div.
R AND D EQUIPMENT INFORMATION REPORT: FAULT TOLERANT WEATHER RADAR PROCESSOR Final Report, 1 Jun. 1978 - 16 Oct. 1980
Michael J. Young and Anthony J. Jagodnik, Jr. Mar. 1981 348 p refs
(Contract F19628-78-C-0113; AF Proj. 6670)
(AD-A108253; ER81-4053; AFGL-TR-81-0086) Avail: NTIS HC A15/MF A01 CSCL 17/9

A programmable signal processor which achieves fault tolerance and modularity through distribution of tasks among a number of identical programmable common elements including spares, is described. This processor's design and usage in a meteorological Doppler radar signal processing application is discussed at several levels of detail covering hardware firmware, operating system software, user software, and development aids. Author (GRA)

N82-18810# Science Applications, Inc., Monterey, Calif.
ATLANTIC HURRICANE WIND PROBABILITY FORECASTTING (WINDPA) Final Report
Jerry D. Jarrell Monterey, Calif. Naval Environmental Prediction Research Facility Oct. 1981 23 p refs
(Contract N00228-80-SC-GA08)
(AD-A108756; NEPRF-CR-81-05) Avail: NTIS HC A02/MF A01 CSCL 04/2

The Atlantic Hurricane Wind Probability (WINDPA) program is documented. WINDPA provides the probability of selected Navy and Air Force bases either being struck by an Atlantic Ocean tropical cyclone or receiving winds of at least 30 or 50 kt. The basis for WINDPA estimates is discussed in comparison to a similar western Pacific program (WINDP). WINDPA estimates were subjected to independent reliability testing, the results of which are discussed. GRA

N82-18811# Aeronautical Research Labs., Melbourne (Australia).
LOW LEVEL WIND STUDY, BALD HILLS: THUNDERSTORM SEASON, 1976 - 1977
C. K. Rider, D. J. Sherman, and M. R. Thomson Oct. 1980 511 p refs
(AD-A108207; ARL/STRUC-384; AR-002-237) Avail: NTIS HC A22/MF A01 CSCL 04/2

Contents: Experimental Apparatus and Procedure; Incidence of Thunderstorms; Long Term Wind Speed Statistics; Statistics of Wind Shears; Choice of Incidents; Wind Speed Profiles; Effect of Height, Peak Value Statistics, and Averaging Time; Duration of Shear Bursts; Wind Shear Monitoring as a Landing Aid; and Horizontal Structure of the Wind. GRA

N82-18812# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
RADAR DETECTION OF TURBULENCE IN THUNDERSTORMS
Alan R. Bohne 31 Mar. 1981 64 p refs
(AF Proj. 6670)
(AD-A108679; AFGL-TR-81-0102; AFGL-ERP-736) Avail: NTIS HC A04/MF A01 CSCL 04/2

Theoretical investigations are undertaken to relate intensity of turbulent air motion to Doppler radar spectrum mean and variance in precipitation environments. Examples of theoretical radar derived turbulence power density spectra and total precipitation motion variance show that effects due to imperfect particle response are significant for turbulence scale lengths less than 250 m. Doppler spectrum variance and estimated eddy dissipation rate (epsilon) are found strongly dependent upon precipitation environment for ranges less than about 20 km, and for cases where the turbulence outer scale length (lambda) is less than 0.5 km. They are also found to be essentially independent of lambda when the maximum pulse volume dimension is less than 1/2 lambda, and independent of range

but strongly dependent on lambda at ranges where the maximum pulse volume dimension is greater than lambda. Estimation of epsilon by radar is shown to be unreliable until a method of remotely determining lambda is found. Nevertheless, classification of turbulence severity (index = cube root of epsilon is possible with only a reasonable guess of lambda. Analyses of aircraft/gust velocity data indicate that thunderstorm turbulence is localized into discrete patches, and that such localization must be accounted for when aircraft gust velocity data undergo power spectrum analysis. GRA

N82-18813# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

SHORTRANGE FORECASTING OF CLOUDINESS AND PRECIPITATION THROUGH EXTRAPOLATION OF GOES IMAGERY Final Report

H. Stuart Muench 16 Jul. 1981 48 p refs
(AF Proj. 6670)
(AD-A108678; AFGL-TR-81-0218; AFGL-ERP-750) Avail: NTIS HC A03/MF A01 CSCL 04/2

This report describes the development and testing of an objective technique to forecast cloudiness and precipitation through extrapolation of satellite imagery. By using an objectively determined cloud-motion vector, the technique makes local forecasts of satellite parameters (brightness and IR temperature), with high temporal resolution, using simple linear extrapolation. Algorithms are then used to convert the satellite parameters to total cloud cover, probability of 1-hour precipitation, and presence of low, middle, and high clouds. The test program computed motion vectors and made forecasts out to 7 hours, in half-hour steps, at 30 locations. The program was tested on 12 spring and fall cases, using half-hourly GOES imagery. For periods beyond 2 hours, forecasts of cloud cover and precipitation were markedly better than persistence, while deficiencies in specification hindered short-period performance. Forecasts of cloud layers were worse than persistence due to inadequate specification algorithms. The net results were quite encouraging. GRA

N82-18814# Air Force Geophysics Lab., Hanscom AFB, Mass. Aeronomy Div.

WIND TUNNEL AND LABORATORY CALIBRATION OF BALLOON-BORNE WIND SENSORS Interim Report

J. H. Brown and R. E. Good 27 Jul. 1981 33 p refs
(AF Proj. 6687)
(AD-A108676; AFGL-TR-81-0219; AFGL-IP-303) Avail: NTIS HC A03/MF A01 CSCL 14/2

Two-low speed wind sensors have been calibrated for measuring the wind speed at an instrument suspended below stratospheric balloons. The low Reynolds number environment was duplicated at the NASA/Ames low-speed MARSWIT wind-tunnel facility, and in a laboratory bell jar. The two new instruments are the time-of-flight instrument that measures the motion of an ion cloud through an open pipe, and the corona anemometer that measures the displacement of an ion beam transversing the air-stream flowing between two plates. The calibrations consist of placing the instruments in a flow stream, and relating the instrument output to the flow-stream velocity. The laboratory calibration is easy to conduct, but is limited to a measurement of internal flow velocity. The wind-tunnel calibration is performed to relate laboratory calibration to freestream conditions. Author (GRA)

N82-18815# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

AN AUTOMATED LOW CLOUD PREDICTION SYSTEM Final Scientific Report

Edward B. Geisler 7 Jul. 1981 38 p refs
(AF Proj. 6670)
(AD-A108681; AFGL-TR-81-0191; AFGL-ERP-746) Avail: NTIS HC A03/MF A01 CSCL 04/2

At the Air Force Geophysics Laboratory (AFGL) Weather Test Facility (WTF) at Otis AFB, MA, a network of cloud base height, visibility, and wind measuring instruments were used to explore techniques for the short range prediction of low cloud ceiling. The approach relies upon the use of a hierarchical clustering algorithm to transform the raw cloud base height data into an automated low cloud observation. Four prediction techniques (Regression Estimation of Event Probabilities, Equivalent Markov, climatology, and persistence) yielding probability estimates of low cloud ceiling were evaluated and comparisons made to determine their respective accuracy and reliability. In addition, thresholding techniques were used to convert probability forecasts (unit bias, maximum probability, iterative, and persistence). Analysis of the data collected at the AFGL WTF demonstrates the accuracy and reliability of the automated low cloud prediction system. Regression estimation of event probabilities provided accurate, reliable, high resolution probability forecasts with results superior to climatology, persistence, and Equivalent Markov. GRA

N82-18816# National Climatic Center, Asheville, N. C.

WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 1: NEW ENGLAND REGION Final Report

Jun. 1981 287 p
(Contract DOT-FA79WAI-057)
(AD-A108155) Avail: NTIS HC A13/MF A01 CSCL 04/2

This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Data airports in Cnnecticut, Massachusetts, Main, New Hampshire, Rhode Island, and Vermont are included. GRA

N82-18817# National Climatic Center, Asheville, N. C.

WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS, VOLUME 2. PART A: EASTERN REGION Final Report

Jun. 1981 436 p
(Contract DOT-FA79WAI-057)
(AD-A108156) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Data on airports in Virginia, Delaware, Maryland, New Jersey, and New York are included. GRA

N82-18818# National Climatic Center, Asheville, N. C.

WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 2, PART B: EASTERN REGION Final Report

Jun. 1981 421 p
(Contract DOT-FA79WAI-057)
(AD-A108157) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Data on airports in Pennsylvania, Virginia, and West Virginia are included. GRA

N82-18819# National Climatic Center, Asheville, N. C.

WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 3, PART A: SOUTHERN REGION Final Report

Jun. 1981 505 p
(Contract DOT-FA79WAI-057)
(AD-A108158) Avail: NTIS HC A22/MF A01 CSCL 04/2

This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the appiication of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18820# National Climatic Center, Asheville, N. C.

WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 3, PART B: SOUTHERN REGION Final Report

Jun. 1981 456 p
(Contract DOT-FA79WAI-057)
(AD-A108159) Avail: NTIS HC A20/MF A01 CSCL 04/2

This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application

of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18821# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 4, PART A: GREAT LAKES REGION Final Report
Jun. 1981 560 p
(Contract DOT-FA79WAI-057)
(AD-A108160) Avail: NTIS HC A24/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18822# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 4, PART B: GREAT LAKES REGION Final Report
Jun. 1981 429 p
(Contract DOT-FA79WAI-057)
(AD-A108161) Avail: NTIS HC A19/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Data on airports in Minnesota, Ohio and Wisconsin are included. GRA

N82-18823# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 5, PART A: CENTRAL REGION Final Report
Jun. 1981 316 p
(Contract DOT-FA79WAI-057)
(AD-A108162) Avail: NTIS HC A14/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18824# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 5, PART B: CENTRAL REGION Final Report
Jun. 1981 258 p
(Contract DOT-FA79WAI-057)
(AD-A108163) Avail: NTIS HC A12/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. GRA

N82-18825# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 6, PART A: SOUTHWEST REGION Final Report
Jun. 1981 416 p
(Contract DOT-FA79WAI-057)
(AD-A108164) Avail: NTIS HC A18/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. GRA

N82-18826# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 6, PART B: SOUTHWEST REGION Final Report
Jun. 1981 521 p
(Contract DOT-FA79WAI-057)
(AD-A108165) Avail: NTIS HC A22/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. GRA

N82-18827# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 7, PART A: ROCKY MOUNTAIN REGION Final Report
Jun. 1981 387 p
(Contract DOT-FA79WAI-057)
(AD-A108166) Avail: NTIS HC A13/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18828# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 7, PART B: ROCKY MOUNTAIN REGION Final Report
Jun. 1981 451 p
(Contract DOT-FA79WAI-057)
(AD-A108167) Avail: NTIS HC A20/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. GRA

N82-18829# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 8: NORTHWEST REGION Final Report
Jun. 1981 432 p
(Contract DOT-FA79WAI-057)
(AD-A108168) Avail: NTIS HC A19/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18830# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 9, PART A: WESTERN REGION Final Report
Jun. 1981 386 p
(Contract DOT-FA79WAI-057)
(AD-A108169) Avail: NTIS HC A17/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18831# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 9, PART B: WESTERN REGION Final Report
Jun. 1981 365 p
(Contract DOT-FA79WAI-057)
(AD-A108170) Avail: NTIS HC A16/MF A01 CSCL 04/2
This report provides summary tables and graphic wind roses depicting wind direction and speed under specific ceiling - visibility conditions at 283 airports. This data will be used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Author (GRA)

N82-18832# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 10, PART A: ALASKAN AND PACIFIC REGIONS Final Report
Jun. 1981 350 p
(Contract DOT-FA79WAI-057)
(AD-A108171) Avail: NTIS HC A15/MF A01 CSCL 04/2
Summary tables and graphic wind roses depicting wind direction and speed under specific ceiling are provided. This data

is used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. GRA

N82-18833# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 10, PART B: ALASKAN AND PACIFIC REGIONS Final Report
Jun. 1981 339 p
(Contract DOT-FA79WAI-057)
(AD-A108172) Avail: NTIS HC A15/MF A01 CSCL 04/2

The data are used in the application of FAA's establishment criteria for precision and non-precision approach and landing aids. Summary tables and graphic wind roses depicting wind direction and speed under specific ceiling are provided. GRA

N82-18834# National Climatic Center, Asheville, N. C.
WIND-CEILING-VISIBILITY DATA AT SELECTED AIRPORTS. VOLUME 11: VISIBILITY TIME SERIES FOR KEY STATIONS Final Report
Jun. 1981 238 p
(Contract DOT-FA79WAI-057)
(AD-A108177) Avail: NTIS HC A11/MF A01 CSCL 04/2

Data presented in volumes 1-10 are based on 3-hourly observations. 51 key stations were selected for comparison of hourly observations versus 3-hourly observations. Statistical variations were noted in 18 cases for which detailed comparisons are presented. Author (GRA)

N82-18835# National Oceanic and Atmospheric Administration, Boulder, Colo.
DEVELOPMENT OF A CLEAR AIR RADAR TO DETECT METEOROLOGICAL HAZARDS AT AIRPORTS Final Report, 1 Oct. 1978 - 21 Sep. 1981
R. B. Chadwick, K. P. Moran, W. C. Campbell, K. B. Earnshaw, and T. R. Detman 21 Sep. 1981 113 p refs
(Contract ESD-0-0630; AF Proj. 6670)
(AD-A108236; AFGL-TR-81-0268) Avail: NTIS HC A06/MF A01 CSCL 17/9

To be useful in detecting meteorological hazards such as low-level wind shear near airports, a radar must be able to: (1) detect backscatter from both clear air and rain; (2) operate at short ranges and low elevation angles; and (3) measure Doppler frequencies caused by air motion. The development of a radar with these characteristics is described and the results of testing this radar at airports are presented. Special emphasis is placed on the problems of low elevation angle operation and clutter suppression. The importance of proper siting is pointed out. In addition, it is demonstrated that the radar can readily detect the turbulent wakes of large jet aircraft. Author (GRA)

N82-18836# Naval Air Systems Command, Washington, D. C.
US NAVY MARINE CLIMATIC ATLAS OF THE WORLD. VOLUME 9: WORLD-WIDE MEANS AND STANDARD DEVIATIONS
Oct. 1981 355 p refs
(AD-A108222; NAVAIR-50-1C-65-Vol-9) Avail: NTIS HC A16/MF A01 CSCL 04/2

The eight volume series of the U.S. Navy Marine Climatic Atlas of the World has had world-wide acceptance as an authoritative reference for large scale operational planning and applied research. This volume, based on the entire period of record available, resulted from the need to develop an automated quality control scheme for marine observations for use in the revision of the first 5 volumes of Atlas series. This was basically achieved by summarizing, analyzing and digitizing the mean and standard deviation charts that appear in this volume.
Author (GRA)

N82-18837# Drexel Univ., Philadelphia, Pa. Dept. of Physics and Atmospheric Science
EXPERIMENTS IN REGIONAL SCALE NUMERICAL WEATHER PREDICTION INCLUDING USE OF SESAME '79 DATA Final Report
Carl W. Kreitzberg Aug. 1981 10 p
(Contract F49620-79-C-0208; AF Proj. 2310)
(AD-A108372; AFOSR-81-0770TR) Avail: NTIS HC A02/MF A01 CSCL 04/2

This research has as a goal testing of a state-of-the-art mesoscale model using a unique set of meteorological data and to gain insight into the modeling of radiation, clouds, precipitation and boundary layer effects in such models. Development of four dimensional data assimilation schemes and analysis of the sensitivity of the model to horizontal and vertical resolution were also to be accomplished. The four dimensional assimilation was deemphasized, at this time, when it became clear that the sensitivity results differed greatly from storm to storm. Scientific papers have been prepared that demonstrate the usefulness and sensitivity of such models in studying the evolution of meso-alpha (regional or sub-synoptic) and meso-beta (fronts; convection bands) disturbances. Specifically, it is clear that latent heating from convection can greatly alter the wind field on scales of 1,000 km. The first SESAME '79 case, April 10, 11, 1979 that produced the Wichita Falls, TX tornado was unique in that the cyclonic scale could not be predicted from the conventional data. The substantial variation in predictability suggests that considerable emphasis should, in the future, be placed on four dimensional data assimilation. Author (GRA)

N82-18838# Danish Meteorological Inst., Copenhagen.
THE CLIMATE OF DENMARK. SUMMARIES OF OBSERVATIONS FROM LIGHT VESSELS. PART 1: WIND, VISIBILITY, AIR TEMPERATURE CLOUD COVER, AND WEATHER
Agnes Sparre 1981 243 p In ENGLISH and DANISH Original contains color illustrations
(DMI-CLIMATOL-PAPERS-8; ISBN-87-7478-171-5) Avail: NTIS HC A11/MF A01

The seasonal variations in meteorological parameters, especially the annual variation in wind direction and force and the annual variation in visibility are discussed. Conjunction of wind with visibility is mentioned. The number of days with precipitation, with lightning and thunder, with hail, and the seasonal and daily variation in cloud cover and air temperature are reported. Author (ESA)

N82-18839# World Meteorological Organization, Geneva (Switzerland).
MANUAL ON MARINE METEOROLOGICAL SERVICES. (ANNEX 6 TO THE WMO TECHNICAL REGULATIONS)
1981 91 p refs Original contains color photographs
(WMO-558; ISBN-92-63-10558-8) Avail: NTIS MF A01; print copy available at WMO, Geneva SwFr 23

The regulatory material, dealing essentially with international obligations of Members in providing marine meteorological services relative to the high seas, coastal and offshore areas, and to harbor approaches and ports, is presented. The manual is designed to facilitate cooperation in respect to international coordination of marine meteorological services and to ensure uniformity in the practices and procedures employed.
Author (ESA)

N82-18840# Aeronautical Research Inst. of Sweden, Stockholm. Structures Dept.
LONG RANGE LASER ANEMOMETRY WITH PARTICULAR REFERENCE TO WIND POWER DEVELOPMENT
L. Danielsson and E. R. Pike (Royal Signals and Radar Estab., Malvern, England) 6 Oct. 1981 51 p refs Submitted for publication
(Contract NE-5061-014)
(FFA-TN-HU-2262-Pt-3) Avail: NTIS HC A04/MF A01

Literature on atmospheric scattering of visible (Ar^+) and IR (CO_2) laser beams with transit time and Doppler processing was reviewed. A decision flow diagram for geometrical specifications of wind measurements and comparison tables are provided in order to show which system is best for any given task, e.g., wind generator interaction. When range resolution, flexibility, and economic requirements permit, an IR system is recommended. The economic advantages of time multiplexing are pointed out.
Author (ESA)

N82-18841# National Oceanic and Atmospheric Administration, Boulder, Colo. Office of Weather Research and Modification.
FLORIDA AREA CUMULUS EXPERIMENT (FACE), 1980: OPERATIONAL SUMMARY AND DATA INVENTORY
Jun. 1981 193 p refs
(PB82-113291; NOAA-TM-ERL-OWRM-5; NOAA-81082101) Avail: NTIS HC A09/MF A01 CSCL 04B

The last field year of the confirmation phase of the Florida Area Cumulus Experiment was conducted in 1980 following summer experiments in 1978 and 1979. The purpose of FACE-2 is confirmation of the results of FACE-1, which suggest that dynamic seeding was instrumental in increasing precipitation over a fixed target area. The period for experimentation in 1980 was 16 June through 31 August. During this 77 day period, randomized cloud seeding and other studies were conducted. GRA

N82-18842# Florida State Univ., Tallahassee. Dept. of Meteorology.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS. TECHNICAL REPORT 40: ATLAS OF THE JOINT 2 1976 AIRCRAFT WINDS FOR THE 500 FOOT LEVEL
D. W. Stuart and A. I. Watson Jun. 1981 71 p refs
(Grant NSF OCE-77-27735)
(PB82-113911; FSU-MET-STU-81-3; NSF/IDOE-81-45; NSF/IDOE/CUEA/TR-40) Avail: NTIS HC A04/MF A01 CSCL 04B

Maps of winds at 500 ft are presented for thirteen individual flights using aircraft data gathered during daytime (1000-1600 hours) flights made in March - April as a part of a data analysis program. Details of the data reduction and analysis techniques are discussed. The total wind field is shown by maps of the streamlines and isotachs while the alongshore and onshore components are shown by isotach maps. Maps of the 500 ft winds on the individual flights reveal the flow is generally steady and parallel to the coast but with onshore flow near the mouth of the Ica River. Author (GRA)

N82-18843# Florida State Univ., Tallahassee. Dept. of Meteorology.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS. ATLAS OF THE JOINT 2 1977 AIRCRAFT WINDS FOR THE 500 FOOT LEVEL
D. W. Stuart and G. L. Moody Jul. 1981 71 p refs
(Grant NSF OCE-77-27735)
(PB82-113929; FSU-MET-STU-81-4; NSF/DOE-81-46; NSF/DOE/CUEA/TR-66) Avail: NTIS HC A04/MF A01 CSCL 04B

Maps of winds at 500 ft are presented for twelve (12) individual flights using aircraft data gathered during daytime (1000-1500) hours flights made in March - April - May. Details of the data reduction and analysis techniques are discussed. The total wind field is shown by maps of the streamlines and isotachs while the alongshore and onshore components are shown by isotach maps. Maps of the 500 ft winds on the individual flights reveal that the flow is generally steady and parallel to the coast but with onshore flow near the mouth of the Ica River. Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-18844# Office of Technology Assessment, Washington, D. C.
TECHNOLOGY AND OCEANOGRAPHY: AN ASSESSMENT OF FEDERAL TECHNOLOGIES FOR OCEANOGRAPHIC RESEARCH AND MONITORING
Jun. 1981 27 p
(OTA-O-142) Avail: NTIS HC A03/MF A01

The status of technologies used to collect data about the ocean and to conduct experiments in the ocean is addressed. Problems and opportunities are analyzed and the Federal agencies and programs charged with conducting oceanic studies and providing the necessary management and hardware systems are examined. Selected national programs directed toward conserving and managing marine fishery resources, developing an oceanographic satellite system investigating the geology and possible resource potential of the continental margins beneath the deep ocean, and developing a climate prediction capability are analyzed. S.L.

N82-18845# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FILTRATION OF ELEMENTS OF ORBITAL IMAGES CONTAMINATED BY CLOUDS, TO OBTAIN IMPROVED MEASUREMENTS OF THE BLACK BODY TEMPERATURE FOR USE IN OCEANOGRAPHY [FILTRAGEN DE ELEMENTOS DE IMAGENS ORBITALS CONTAMINADAD POR NUVENS, PARA A OBENTCAO DE MEDICOES MELHORADAS DA TEMPERATURA DE CORPO NEGRO, PARA USO EM OCEANOGRAFIA]
Merritt Raymond Stevenson and Hector Manuel Inostroza Villagra Jun. 1981 18 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2121-RPE/345) Avail: NTIS HC A02/MF A01

The inherent problem of the presence of clouds and of cloud contamination in satellite data (pixels) was reviewed. A statistical model is proposed to explain the spatial variability observed in some AVHRR and VISSR data of NOAA-6 and SMS-2 satellites. Basically the approach assumes that the field of view contains different subpopulations, that is to say, surface measurements of unobstructed relatively warm water temperature, partially obscured water with a lower temperature, and clouds with the lowest range of temperature. The equivalent statistical field is obtained by assuming a linear combination of the three (or more) subpopulations where each one of them can be represented by a Gaussian function. A method to eliminate the clouds from the field of view by utilizing the approach where histograms of subsamples contained within larger samples are sequentially evaluated to determine the extent in which the elements of the image are contaminated, is proposed. T.M.

N82-18846# Science Applications, Inc., McLean, Va.
A DYNAMICAL MODEL OF WIND-INDUCED NEAR-INERTIAL MOTIONS Technical Report, Nov. 1980 - Oct. 1981
David M. Rubenstein Nov. 1981 63 p refs
(Contract N00014-81-C-0084)
(AD-A108687; SAI-82-598-WA; OPD-TR-424-81-274-02) Avail: NTIS HC A04/MF A01 CSCL 08/3

A semispectral model of upper ocean inertial motions is developed. The model is solved with a Fourier-Chebyshev expansion in the spatial dimensions, and numerically in time. The model allows the user to specify arbitrary vertical profiles of mean stratification and eddy diffusivity. The model is driven by a wind stress function which is an arbitrary function of time. The model is tested against analytic time-dependent Ekman-layer solutions. The comparisons are excellent. The model is used to simulate the response to a delta-function wind stress impulse. Two cases are presented; one with uniform profiles of stratification and eddy diffusivity, and one with nonuniform profiles. Response functions of wavenumber and frequency are computed for current velocity and shear. The response is shown to be in resonance near the lowest two modes of the internal wave dispersion relation. Author (GRA)

N82-18847# Science Applications, Inc., McLean, Va.
MODELS OF NEAR INERTIAL VERTICAL SHEAR
David M. Rubenstein Nov. 1981 70 p refs
(Contract N00014-81-C-0084)
(AD-A108686; SAI-82-546-WA; OPD-81-274-04) Avail: NTIS HC A04/MF A01 CSCL 08/3

The physics of the interactions between the wind stress, the Ekman layer, and internal waves are reviewed. A general set of equations which describe near-inertial motions are developed. The time dependent behavior of the wind-forced Ekman layer is examined. Then we consider two classes of resonance conditions. The first involves the resonance between the wind field and Ekman pumping, while the second class is the resonance between a propagating Ekman pumping field and the internal wave field. Author (GRA)

N82-18848# Science Applications, Inc., McLean, Va.
STATISTICAL MODELING OF SHEAR IN THE UPPER OCEAN Technical Report, 1 Jan. 1980 - 24 Mar. 1981
Gerald T. Hebenstreit and Walter J. Grabowski 1 Mar. 1981 75 p refs
(Contract N00014-81-C-0084)

(AD-A108212; SAI-82-382-WA) Avail: NTIS HC A04/MF A01 CSCL 20/4

Analysis of upper ocean shear profiles obtained with a free-fall sampling instrument (YVETTE) indicated that, within specific depth regimes and for specified vertical differencing intervals, values of shear-squared might be distributed according to a chi squared probability distribution. An analysis based on several assumptions about the shear field produced a model which showed that a chi squared distribution was physically reasonable. Statistical tests on the profiles led to acceptance of the hypothesis that S squared follows a chi squared distribution with a variance derived from the mean-squared shear in the regime. Further statistical tests showed that the necessary assumptions about the horizontal shear components were statistically reasonable as well as physically reasonable. A trial prediction using a simple linear relationship between mean Brunt-Vaisala frequency in a regime and mean shear-squared, based on a 2m separation, in the regime showed the chi squared model to be a potentially useful tool for area characterizations. GRA

N82-18849# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Experimental Engineering Div.

SUBSEA TRENCHING IN THE ARCTIC

Malcolm Mellor Sep. 1981 38 p refs

(Contract N68305-80-WR-00186)

(AD-A108341; CRREL-81-17) Avail: NTIS HC A03/MF A01 CSCL 13/2

Environmental conditions are described for the continental shelf of the western Arctic, and for the shelf of Labrador and Newfoundland. Special emphasis is given to the gouging of bottom sediments by ice pressure ridges and icebergs, and an approach to systematic risk analysis is outlined. Protection of subsea pipelines and cables by trenching and direct embedment is discussed, touching on burial depth, degree of protection, and environmental impact. Conventional land techniques can be adapted for trenching across the beach and through the shallows, but in deeper water special equipment is required. The devices discussed include hydraulic dredges, submarine dredges, plows, rippers, water jets, disc saws and wheel ditchers, ladder trenchers and chain saws, routers and slot millers, ladder dredges, vibratory and percussive machines, and blasting systems. Consideration is given to the relative merits of working with seabed vehicles, or alternatively with direct surface support from vessels or from the sea ice. Author (GRA)

N82-18850# Oregon State Univ., Corvallis. School of Oceanography.

MESOSCALE STUDIES OF FLOW REGIMES AND FLUXES OF PARTICULATE MATTER IN COASTAL WATERS Annual Progress Report, 1 Apr. 1980 - 30 Sep. 1981

David M. Nelson, Hasong Pak, Lawrence F. Small, and J. Donald V. Zaneveld Sep. 1981 48 p refs

(Contracts EY-76-S-06-2227; DE-AT06-76EV-70029)

(DE82-001740; DOE/EV-70029/15) Avail: NTIS HC A03/MF A01

Progress is reported on the similarity of the Quinault Canyon and the Oregon Coast, suspended particulate matter, thermocline oxygen maxima and coastal upwelling, seasonality in bottom nepheloid layers and overlying waters, and in-situ fluorometer development. Biomass growth was studied by relating it to levels of particulate concentration and composition. DOE

N82-18851# Delaware Univ., Newark.

THE PROPAGATION OF INERTIAL-INTERNAL WAVES IN COASTAL UPWELLING REGIONS Ph.D. Thesis

Walter Robertson Johnson Jun. 1981 313 p refs

(Grant NSF OCE-77-28354)

(PB82-113275; CMS-01-81; NSF/IDOE-81-79) Avail: NTIS HC A14/MF A01 CSCL 08C

Internal tidal and near-inertial-internal waves in a coastal upwelling zone are investigated, in which the mean flow and density field, and their gradients, modified the wave propagation. A theoretical development of internal wave propagation and ray trajectory calculations are discussed, and the results from observations acquired as part of the JOINT II experiments off Peru are given. GRA

N82-18852# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

HF RADAR MEASUREMENTS OF SURFACE CURRENTS IN THE GERMAN BIGHT DURING MARSEN PHASE 2, PART 2 Technical Memo, 24-28 Sep. 1979

Robin S. Lyons Jul. 1981 31 p refs

(PB82-124553; NOAA-TM-ERL-WPL-75; NOAA-81092904) Avail: NTIS HC A03/MF A01 CSCL 08C

Instantaneous surface currents in the German Bight, measured with an HF radar system (called CODAR) during the marine remote sensing experiment are presented. The data set is from four hour interval sampling. GRA

N82-18853# Woods Hole Oceanographic Institution, Mass. Marine Policy Program.

GEORGES BANK: AN ANNOTATED BIBLIOGRAPHY OF ATLASES, INVENTORIES AND MAP SERIES

Richard L. Price May 1981 75 p refs Sponsored by Mellon (Andrew W.) Foundation and Pew Memorial Trust

(Grant NA80AA-D-00077)

(PB82-107665; WHOI-81-46; NOAA-81073006) Avail: NTIS HC A04/MF A01 CSCL 08J

The bibliography reviews inventory-like studies of the Georges Bank region and presents information on the scope of the work, topics treated, geographic area of concern, and audience. The primary purpose was to evaluate the nature and type of maps used in the works reviewed so the notations include the number of maps, their formats and scales, cartographic quality and base map content. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-18854*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PHYSIOLOGICAL RESPONSES TO PROLONGED BED REST AND FLUID IMMERSION IN MAN: A COMPENDIUM OF RESEARCH (1974 - 1980)

John E. Greenleaf, Lori Silverstein (San Jose State Univ.), Judy Bliss, Vicki Langenheim, Heidi Rosson (California Univ., Davis), and Clinton Chao (California Univ., Berkeley) Jan. 1982 112 p

(NASA-TM-81324; A-8709) Avail: NTIS HC A06/MF A01 CSCL 06S

Water immersion and prolonged bed rest reproduce nearly all the physiological responses observed in astronauts in the weightless state. Related to actual weightlessness, given responses tend to occur sooner in immersion and later in bed rest. Much research was conducted on humans using these two techniques, especially by Russian scientists. Abstracts and annotations of reports that appeared in the literature from January 1974 through December 1980 are compiled and discussed. Author

N82-18855# Ohio State Univ., Columbus. Dept. of Veterinary Pathobiology.

MOLECULAR INTERACTIONS OF HIGH ENERGY FUELS AND JET FUELS WITH ONCOGENIC VIRUSES AND ENDOGENOUS VIRUSES Annual Report, 31 Jul. 1980 - 15 Sep. 1981

James R. Blakeslee, Jr. Oct. 1981 110 p refs

(Contract F49620-80-C-0087; AF Proj. 2312)

(AD-A108377; AFOSR-81-0765TR) Avail: NTIS HC A06/MF A01 CSCL 06/2

The objectives of this research are to develop rapid in-vitro assays to evaluate the carcinogenic potential of chemicals used by the U.S. Air Force. Snyder-Theilen Feline Sarcoma Virus (ST FeSV), quantitatively transforms human skin fibroblasts following second order kinetics. These studies were performed in order to determine whether chemicals altered ST FeSV transformation in a predictable manner and to correlate the alteration with the carcinogenic or non-carcinogenic activity of the text chemical. The results, to date, show diverse carcinogens classed as: aromatic amines, polycyclic hydrocarbons, Aminofluorenes, hydrazines, asbestos and mycotoxins inhibited virus transformation when virus infected cells (2 hours post-infection)

were exposed to test chemical, while non-carcinogenic chemicals had no significant effect on transformation. Triton X-100, acetone, petroleum and shale oil derived JP5; RJ5 and diesel fuel, marine, demonstrated non-carcinogenic activity while formaline demonstrated carcinogenic activity. Experiments designed to show the specificity of the antagonistic effect of known carcinogens are reported. Disulfuram inhibits biotransformation of 1,2 symmetrical dimethyl hydrazine (SDMH) metabolites, azomethane to azoxymethane (ultimate carcinogen) thereby preventing carcinogenic effect of the proximate carcinogen SDMH. Detailed methodology required to ascertain effect of chemicals on ST FeSV pro-virus integration and synthesis are presented. GRA

N82-18265*# Pennsylvania Univ., Philadelphia.
NUTATION OF HELIANTHUS ANNUUS IN A MICROGRAVITY ENVIRONMENT
Allan H. Brown *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06C

N82-18267*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Abteilung Biophysik.
MICROORGANISMS AND BIOMOLECULES IN SPACE HARD ENVIRONMENT
G. Horneck *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06C

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-18856* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 227. JANUARY 1982
Jan. 1982 66 p
(NASA-SP-7011(227)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 166 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1981. Author

N82-18857 Royal Aircraft Establishment, Farnborough (England). Engineering Physics Dept.
SCATTER DIAGRAMS BASED ON THE ANTHROPOMETRIC SURVEY OF 2000 ROYAL AIRFORCE AIRCREW (1970/1971)
R. E. Simpson and E. Violet Hartley 10 Feb. 1981 154 p refs
(RAE-TR-81017; RAE-EP-763; BR79375) Copyright. Avail: Issuing Activity

An anthropometric survey was conducted in order to provide information for aircrew clothing, personal equipment and aircraft workspace design purposes. Scatter diagrams of pairs of measurements of value to engineers, ergonomists or clothing designers who require information on the interrelationship between specific measurements are presented. Each subject is represented by a pair of coordinates, x and y, which represent the two measurements considered. Information on the number of subjects to which the diagram relates, means of x and y variate values, correlation coefficient, and regression equations for the x and y variates are given. Functional clothing sizing is based on two control measurements, e.g., stature and chest circumference for one piece coveralls. Author (ESA)

N82-18858*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT: SPACE SHUTTLE PROGRAM. STS-2 POSTFLIGHT MEDICAL OPERATIONS
29 Jan. 1982 23 p
(NASA-TM-84135; E-989-81-02) Avail: NTIS HC A02/MF A01 CSCL 06S

The STS-2 mission presented the NASA medical team with a series of operational problems associated with the potential contamination of the onboard potable water and altered work/rest cycles. The first problem was traced to the inflight malfunctioning fuel cell, while the second was attributed to the modification of in-flight crew timelines in order to maximize the scientific data acquisition. Shortened sleep period, heavy work laods, inadequate time allocation for food preparation and consumption and estimated low water intake, though tolerable for a 54 hour mission, would have been unacceptable for a longer misson. A contingency plan was developed to restructure in-flight time-lines and institute corrective health maintenance procedures in the event that the mission was extended beyond 54 hours. Minor losses of medical data occurred as a result of the shortened mission duration. All phases of the mission required real-time re-evaluation, identification of potential impact on preexisting medical constraints, and development of appropriate recommendations and solutions. The activities required significant coordination among the different teams involved in medical operations. N.W.

N82-18859*# Houston Univ., Tex. Dept. of Chemistry.
ANALYSIS OF VOLATILE METABOLITES IN BIOLOGICAL FLUIDS AS INDICATORS OF PRODROMAL DISEASE CONDITION Final Report
A. Zlatkis Jan. 1982 25 p refs
(Contract NAS9-15882)
(NASA-CR-167513) Avail: NTIS HC A02/MF A01 CSCL 06E

The volatile profile cannot be defined as a single class of substances, rather it is a broad spectrum of materials of different polarities characterized by having a boiling-point in the low to medium range (up to approximately 300 C) and the fact that the compounds are suitable for gas chromatography without derivatization. The organic volatile profiles are very complex mixtures of metabolic byproducts, intermediates, and terminal products of enzymatic degradations composed mainly of alcohols, ketones, aldehydes, pyrazines, sulfides, isothiocyanates, pyrroles, and furans. The concentration of organic volatiles in biological fluids covers a wide range with many important components present at trace levels. The complexity of the organic volatile fraction requires the use of capillary columns for their separation. T.M.

N82-18860# Texas Univ. at Arlington. Dept. of Mathematics.
STATISTICAL TOOLS FOR DETERMINING FITNESS TO FLY Final Report, Sep. 1978 - Mar. 1980
Patrick L. Brockett and Gerald A. Shea Brooks AFB, Tex. School of Aerospace Medicine Sep. 1981 44 p refs
(Contract F33615-78-C-0623; AF Proj. 7755)
(AD-A108599; SAM-TR-81-20) Avail: NTIS HC A03/MF A01 CSCL 12/1

The goal of this project is to use data from regularly scheduled physical examinations to estimate the probability of an event such as a heart attack. This is done via the construction of a mathematical model. A high probability of an event as computed by the model would be evidence of a high risk case. The model developed here, termed the periodic checkup predictive model, is a survival distribution model similar to the proportional hazards model when there is little or no loss to followup and to logistic regression when the object is to predict the occurrence of an event during a fixed interval of time. Author (GRA)

N82-18861# European Space Agency, Paris (France).
EVALUATION OF THE VISUAL ACQUISITION RANGE OF ENROUTE AIR TRAFFIC FROM COCKPIT OBSERVATIONS
Otto Weber Oct. 1981 56 p refs Transl. into ENGLISH from 'Bestimmung der visuellen Auffassreichweite von Verkehrsflugzeugen im Streckenflug aus Beobachtungen im Cockpit', Rept. DFVLR-Mitt-80A-14 DFVLR, Brunswick, West Germany, Sep. 1980 53 p
(ESA-TT-691; DFVLR-Mitt-80-14) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 11.90

Onboard observations and approach lead time measurements are employed. The results of 29 measurement campaigns conducted by airline pilots are analyzed. Evaluation methods are

described and problems due to converging courses and large cross track distances in the head-on case are treated. The results for the acquisition range and the apparent size of the intruder derived from this range are discussed. The advantages of anticollision and position lights, vapor trials and air traffic control signals for the acquisition process are demonstrated. Data acquisition improvements are suggested. Author (ESA)

N82-18862# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
RESEARCH PREDICTIONS FOR UNDERWATER ACTIVITIES IN THE 1980'S [FORSKNINGSBEHOV INOM 1980-TALETS UNDERVATTENSVERKSAMHET]
Bo Cassel Oct. 1981 29 p In SWEDISH
(FOA-C-58010-H1) Avail: NTIS HC A03/MF A01

Present developments show that technical equipment compliments the diver's work and makes it easier, but cannot take the place of the diver. In bell diving a depth of 700 m was reached in 1981. Data from North Sea diving under harsh weather conditions were studied and make up, to a certain extent, the background of research and development in the next decade. Oil and gas resources at depths between 300 and 600 m will be exploited at that time. Diving at such depths involves special problems. Safety requirements for divers are addressed.
Author (ESA)

N82-18863# Ohio State Univ., Columbus. Coll. of Medicine.
STUDY OF CHLORINE DIOXIDE AND ITS METABOLITES IN MAN
Joseph R. Bianchine, Judith R. Lubbers, Sudha Chauhan, and Judy Miller Sep. 1981 100 p refs
(Grant EPA-R-805643)
(PB82-109356; EPA-600/1-81-068) Avail: NTIS HC A05/MF A01 CSCL 06T

An assessment of the relative safety of chronically administered chlorine water disinfectants in man was undertaken. A rising dose tolerance investigation examined the effects of single dose increasing concentration administration of chlorine disinfectants to normal healthy adult male volunteers. The impact on normal subjects of twelve week daily ingestion of the disinfectants was addressed. Physiological impact was assessed by evaluation of a large battery of qualitative and quantitative tests. In general, the study affirmed the relative safety and tolerance of normal healthy adult males and normal healthy adult male glucose-6-phosphate dehydrogenase deficient individuals to daily twelve week ingestion of 500 mL of chlorine disinfectants at a concentration of 5 mg/L. GRA

N82-18864# Midwest Research Inst., Kansas City, Mo.
HYDROGEN CYANIDE HEALTH EFFECTS Final Report
Bonnie L. Carson, Larry H. Baker, Betty L. Herndon, Harry V. Ellis, III, and Eileen M. Horn Sep. 1981 71 p refs
(Contract EPA-68-03-2928)
(PB82-116039; EPA-460/3-81-026) Avail: NTIS HC A04/MF A01 CSCL 06T

Health effects literature primarily related to inhalation exposures to hydrogen cyanide was collected, evaluated, tabulated and summarized. Approximately 170 documents were collected from computerized and manual literature searches covering the period 1899-1981. Pharmacologists and an M.D. epidemiologist rated the documents according to their applicability to the study and their methodology. The approximately 20 documents considered useful for deriving a range of concern for human exposure to hydrogen cyanide from automotive emissions were tabulated. The 25 pages of tables detail the results of acute and repeated dose testing of mice, rats, guinea pigs, rabbits, cats, monkeys, dogs, goats, donkeys and humans as well as human occupational studies. Most of the documents evaluated are described in an annotated bibliography. GRA

N82-18865# Midwest Research Inst., Kansas City, Mo.
AMMONIA HEALTH EFFECTS Final Report
Bonnie L. Carson, Harry V. Ellis, III, Cecily M. Beall, and Larry H. Baker Sep. 1981 108 p refs
(Contract EPA-68-03-2928)
(PB82-116047; EPA-460/3-81-027) Avail: NTIS HC A06/MF A01 CSCL 06T

Health effects literature primarily related to inhalation exposures to ammonia was collected, evaluated, tabulated, and summarized. Appoximately 200 documents were collected from computerized and manual literature searches covering the period 1886-1981. Pharmacologists and an M.D. epidemiologist rated the documents according to their applicability to the study and their methodology. The approximately 50 documents considered useful for deriving a range of concern for human exposure to ammonia from automotive emissions were tabulated. The 50 pages of tables detail the results of acute, repeated dose, and chronic testing of bats, mice, rats, guinea pigs, chickens, rabbits, cats, monkeys, dogs, turkeys, swine, and humans as well as human occupational and accidental studies. Most of the documents evaluated are described in an annotated bibliography. GRA

N82-18255*# Mainz Univ. (West Germany).
EFFECTS OF RECTILINEAR ACCELERATION, OPTOKINETIC AND CALORIC STIMULI IN SPACE
R. vonBaumgarten *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 5 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18256*# Massachusetts Inst. of Tech., Cambridge.
VESTIBULAR EXPERIMENTS
L. R. Young *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 5 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18257*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VESTIBULO-SPINAL REFLEX MECHANISMS
M. F. Reschke *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18258*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE INFLUENCE OF SPACE FLIGHT ON ERYTHROKINETICS IN MAN
Carolyn S. Leach *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

N82-18259*# Freie Univ., Berlin (West Germany). Physiologisches Inst.
MEASUREMENT OF CENTRAL VENOUS PRESSURE AND DETERMINATION OF HORMONES IN BLOOD SERUM DURING WEIGHTLESSNESS
K. Kirsch *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18260*# Illinois Univ., Urbana.
EFFECTS OF PROLONGED WEIGHTLESSNESS ON THE HUMORAL IMMUNE RESPONSE OF HUMANS
E. W. Voss, Jr. *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 2 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

N82-18261*# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
EFFECT OF WEIGHTLESSNESS ON LYMPHOCYTE PROLIFERATION
Autusto Cogoli *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18262*# Rome Univ. (Italy).
THREE-DIMENSIONAL BALLISTOCARDIOGRAPHY IN WEIGHTLESSNESS
A. Scano *In* NASA. Marshall Space Flight Center Spacelab

Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06E

N82-18264*# Stirling Univ. (Scotland).
MASS DISCRIMINATION DURING WEIGHTLESSNESS
Helen Ross *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06S

N82-18266*# State Univ. of New York at Binghamton.
PRELIMINARY CHARACTERIZATION OF PERSISTING CIRCADIAN RHYTHMS DURING SPACE FLIGHT: NEUROSPORA AS A MODEL SYSTEM
Frank W. Sulzman *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06P

N82-18268*# San Francisco Univ., Calif.
RADIATION ENVIRONMENT MAPPING
E. Y. Benton *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06R

N82-18269*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Aachen (West Germany). Abtelung Biophysik.
ADVANCED BIOSTACK EXPERIMENT
H. Buecker *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 06R

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-18866*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF TACTILE VIBRATION ON ANNOYANCE TO SYNTHESIZED PROPFAN NOISE
Sherman A. Clevenson Dec. 1981 16 p refs Presented at the 102nd Meeting of the Acoust. Soc. of Am., Miami Beach, Fla., 1-4 Dec. 1981
(NASA-TM-83258) Avail: NTIS HC A02/MF A01 CSCL 05H

Design information that maximizes passenger comfort for propfan aircraft is presented. Predicted noise and vibration environments and the resultant passenger acceptability were studied. The effect of high frequency tactile vibration (i.e., greater than 30 Hz) on passenger reactions was analyzed. Passenger reactions to a wide range of noise with and without tactile vibration was studied. The passenger ride quality simulator was employed using subjects who evaluated either synthesized propeller noises only, or these noises combined with seat/arm vibration. The noises ranging from 80-100 dB consisted of a turbulent boundary layer noise with a factorial combination of five blade passage frequencies (50-200 Hz), two harmonic rolloffs, and three tone/noise ratios. It is indicated that passenger reaction (annoyance) to noise is not significantly changed in the presence of tactile vibration. E.A.K.

N82-18867# Illinois Univ., Urbana-Champaign. Engineering-Psychology Research Lab.
TIME-SHARING MANUAL CONTROL AND MEMORY SEARCH: THE JOINT EFFECTS OF INPUT AND OUTPUT MODALITY COMPETITION, PRIORITIES AND CONTROL ORDER
Michael Vidulich and Christopher D. Wickens Dec. 1981 61 p refs
(Contract N00014-79-C-0658; NR Proj. 196-158)
(AD-A108721; EPL-81-4/ONR-81-4) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report addresses some of the issues that must be considered as voice recognition and synthesis (VRAS) technology is integrated into complex man-machine system environments. These issues include the input and output channels demanded by competing activities, task difficulty or workload, the allocation of attention and the nature of the task that - spatial or verbal - will be interfaced with VRAS. The present experiment addresses primarily the first three issues within the framework of multiple resource theory. Ten subjects performed first and second order tracking tasks either alone or concurrently with a Sternberg Memory Search Task with a set size of three letters. In different conditions the memory search task was presented either auditorily (A) or visually (V), and responses were executed with either a speech response (S), or manually (M). These generated four input/output combinations: AS, VS, AM, VM, that could be defined in terms of an increasing degree of resource overlap with the VM tracking task. GRA

N82-18868# Colorado Univ. at Boulder. Inst. of Cognitive Science.
HOW AN UNFAMILIAR THING SHOULD BE CALLED
Patricia Baggett and Andrzej Ehrenfeuch Nov. 1981 33 p refs
(Contract N00014-78-C-0433; NR Proj. 157-422)
(AD-A109179; TR-111-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

An empirical method is described to derive good names for unfamiliar objects. Three principles were used in deriving the names: (1) The vocabulary and structure of the names should be within the user's linguistic capacities; (2) the names should be informationally efficient, namely, short, but at the same time unique; and (3) the names should form a classification system. For example, most names have a generic term and one or more modifiers. These principles lead to the following design for creating good names: Step 1: Names are generated by a group of subjects. Step 2: From the names generated by subjects, the experimenter chooses a subset of the names according to the following criteria: (a) the modal name is chosen, namely, if a particular name is generated more often than others, it is chosen; (b) shorter names are preferred; (c) names chosen stay within the classification system provided by the subjects. Step 3: How good the names are is tested by measuring (1) how well people can match the names with the objects they describe; and (2) how well they can recall the names, given the physical objects. Steps 2 and 3 can be iterated; namely, if a given name is poorly matched or recalled, it can be replaced by another generated name and tested again. The method results in names that form a classification system and that are natural, short, well matched with their physical referents and well recalled. GRA

N82-18869# Technische Hogeschool, Delft (Netherlands). Lab. for Measurement and Control.
IDENTIFICATION OF THE ADAPTIVE FEEDBACK OF THE HUMAN MOTOR SYSTEM USING THE RESPONSE DIFFERENCE METHOD (RDM)
Ton Eland Jul. 1981 131 p refs
(WTHD-134) Avail: NTIS HC A06/MF A01

The role of proprioceptive and visual feedback in generating slow, goal directed movements was investigated using a cybernetic model. The physiological structure of the movement control system is reflected by a feedforward path and a parallel feedback loop. Psychological schemata identified in the feedforward path are the internal model of the task, and the internal model of the motor system load. The RDM uses the differences between a routine and a disturbed response to identify the feedback system. The method was tested by computer simulation and a control stick positioning task. Correlation between model and measured results is >0.95. Visual feedback is only used for a continuous readjustment of the proprioceptive position sense. Proprioceptive feedback tuning is dependent of the velocity of the planned movement. The proprioceptive velocity feedback adapts within 130 msec to an increase in the mass which is moved. Proprioceptive feedback does not adapt to a decreasing mass and/or a changing damping of the load. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-18870*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STS-2 INDUCED ENVIRONMENT CONTAMINATION MONITOR (IECM): QUICK-LOOK REPORT
E. R. Miller, ed. Jan. 1982 76 p refs
(NASA-TM-82457) Avail: NTIS HC A05/MF A01 CSCL 06K

The STS-2/induced environment contamination monitor (IECM) mission is described. The IECM system performance is discussed, and IECM mission time events are briefly described. Quick look analyses are presented for each of the 10 instruments comprising the IECM on the flight of STS-2. A short summary is presented. S.L.

N82-18871*# George Washington Univ., Washington, D.C. Science Communication Div.
BIBLIOGRAPHY ON CARBOHYDRATE SYNTHESIS. SELECTED WORKS, 1861 - 1981
Patricia A. Dufour Jul. 1981 25 p Presented at Workshop on Carbohydrate Synthesis in a Controlled Ecological Life Support System (CELSS), Elkridge, Md., 23-27 Jun. 1981
(Contract NASw-3165)
(NASA-CR-168553) Avail: NTIS HC A02/MF A01 CSCL 07C

International in scope, this bibliography cites 220 articles books, patents, and conference proceedings related to carbohydrate synthesis. The works are listed alphabetically by author in the following categories: (1) experimental and industrial chemistry; (2) space travel and feeding studies; (3) hardware; and (4) general reviews and progress. A.R.H.

N82-18872# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Flugzeuge.
FLIGHT ERGONOMICS IN THE AIRCRAFT INDUSTRY PERSONNEL-ERGONOMIC DEVELOPMENT [FLUGERGONOMIE IN DER LUFTFAHRTINDUSTRIE MIT BESONDERER BERUECKSICHTIGUNG PERSONAL-ERGONOMISCHER ENTWICKLUNGEN]
Ruediger Seifert 4 Jun. 1981 23 p refs In GERMAN
(MBB-FE-301/S/PUB/44) Avail: NTIS HC A02/MF A01

Management systems applied to evaluate qualitative and quantitative personnel requirements for maintaining the man machine system (MMS) were determined. Qualitative personnel requirements are plant operation, attendance, maintenance/placement of the MMS needed, professional specialty, and job qualification. In quantitative personnel requirement the number of needed manpower is determined for every professional specialty and area. Personnel selection is recommended for activities, special abilities, performance, and skills. Personnel selection should be made according to these criteria. It is concluded that ergonomic measures are necessary in the development process of the MMS. Transl. by E.A.K.

N82-18873# Boeing Aerospace Co., Seattle, Wash. Engineering Technology Div.
HUMAN ENGINEERING PROCEDURES GUIDE Final Report, 2 Apr. - 2 Dec. 1979
Charles W. Geer Sep. 1981 245 p refs
(Contract F33615-79-C-0520)
(AD-A108643; D180-25471-1) Avail: NTIS HC A11/MF A01 CSCL 05/5

Human engineering (HE) procedures during the system acquisition process are presented for the assistance of various Air Force and industry personnel. The guide is divided into three parts. The first part of the guide is introductory material which scopes the effort and defines HE and human factors engineering (HFE). The second part provides guidance to Air Force and industry management. The third, and last part is the largest section and it provides assistance to both Air Force and industry persons assigned direct responsibility for HE. The management portion shows current management aspects of the HE process utilizing directives, specifications, regulations and pamphlets. HE activities are described in general terms of both what should be done and when it should be accomplished. GRA

N82-18874# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Human Factors.
ACTIVITIES OF THE COMMITTEE ON HUMAN FACTORS: OCTOBER 1, 1980 - SEPTEMBER 30, 1981 Annual Summary Report
Robert T. Hennessy 30 Nov. 1981 22 p
(Contract N00014-81-C-0017; NR Proj. 196-167)
(AD-A108606) Avail: NTIS HC A02/MF A01 CSCL 05/1

The Committee on Human Factors was established and held its first meeting in December 1980. The three principal accomplishments of the committee during the reporting period were: (a) identifying critical problems in human factors and formulating preliminary statements defining the nature of these problems and the basic research needed to alleviate these problems; (b) establishing membership and guidelines for a special working group on simulation; and (c) planning the conduct of a workshop on applied methodologies that will identify some methodologies suitable for presentation at a tutorial symposium and other methodologies deserving research support. GRA

N82-18875*# Purdue Univ., Lafayette, Ind. School of Industrial Engineering.
MODELING HUMAN ATTENTION ALLOCATION STRATEGIES WITH COMPETING CRITERIA Final Report, Mar. - Aug. 1981
Thiruvenkatasamy Govindaraj Oct. 1981 22 p refs
(Grant AF-AFOSR-0144-81; AF Proj. 2313)
(AD-A108509; AFOSR-81-0785TR) Avail: NTIS HC A02/MF A01 CSCL 05/8

In supervisory control situations involving multiple human operators, proper cooperation and coordination is essential. In addition to their individual tasks, the operators are jointly responsible for certain tasks. It is usually not clear when and who should take responsibility for the joint tasks. Proper scheduling of tasks and appropriate allocation of resources are necessary for optimal performance, and in some instances, for overall safety. Understanding how multiple operators interact requires the understanding of single operator performance. A model based on Pareto optimality and Fuzzy Set theory was developed for the human operation. An experimental paradigm had been developed earlier to study the human monitor. The scenario used was similar to monitoring the spread of forest fires, and timely identification of threatening conditions. Experiments were conducted based on the paradigm. Results showed that the operators used updates to reduce the uncertainty to a sufficiently low level before starting threat classification. Sites where the probability of damage was close to 0.5 were more difficult to classify. Author

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N82-18876 California Univ., Berkeley.
PERFORMANCE LIMITS OF INTEGRATED CIRCUIT SIMULATION ON A DEDICATED MINICOMPUTER SYSTEM Ph.D. Thesis
Ellis Cohen 1981 182 p
Avail: Univ. Microfilms Order No. 8200059

An investigation was made concerning the performance limits of circuit-level IC simulation on a dedicated microprogrammable minicomputer system. Investigation shows that circuit analysis can be performed successfully with single precision (32-bit) arithmetic through the use of a combination of numerical pivoting, sparse matrix techniques, a generalization of the indefinite admittance matrix, and voltage thresholds in the algorithms controlling convergence. The use of microcode to extend the computer instruction set greatly improves simulation speed by directly and efficiently performing several of the most time-consuming portions of the analysis. These special instructions reduce the memory requirements compared to larger computers. The development of a new IC simulation program, SPUDS, designed to obtain the best possible performance from a specific minicomputer system has resulted. Conclusions are made concerning the suitability of several microprocessor systems for circuit-level simulation. Dissert. Abstr.

N82-18877 Minnesota Univ., Minneapolis.
PERFORMANCE EVALUATION OF A MULTIPLE PROCESSOR SYSTEM WITH SHARED BUSSES Ph.D. Thesis
Pauline Markenscoff 1981 283 p
Avail: Univ. Microfilms Order No. 8125990

The performance of a multiple processor system which is suitable for the solution of real time control problems is studied. Deterministic models are developed for such systems. In the case of a single bus it is proved that after a number of task executions the operation of the system becomes cyclic with a constant cycle time. The speed of convergence to this cyclic state is estimated and an expression for the constant cycle time is derived. The processing power is also evaluated and is proved to be independent of the order in which the processors transmit through the bus. Techniques for partitioning the task to maximize the processing power are proposed. In the case of a multiple bus system two different bus scheduling schemes are proposed. A stochastic model equivalent to the deterministic one is studied. It involves the study of a finite population queue with Poisson arrivals and Poisson service times and a special priority service discipline different from these found in the literature. Both equal and unequal average execution and data transmission times for the different subtasks are analyzed. Dissert. Abstr.

N82-18878 North Carolina Univ. at Chapel Hill.
COORDINATION OF COMPUTATION IN A BINARY TREE OF PROCESSORS: AN ARCHITECTURAL PROPOSAL Ph.D. Thesis
Donald MacDavid Tolle 1981 230 p
Avail: Univ. Microfilms Order No. 8125627

A design is proposed for a cellular computer consisting of many processors, of two kinds, connected in the form of a binary tree. Both machines are intended for the highly parallel execution of the formal functional programming (FFP) languages of Backus. Both machines, storage permitting, take advantage of all the parallelism expressed in a single program and can execute many programs simultaneously. Both machines, furthermore, decompose each primitive FFP operator into more elementary operations, many of which may be executable concurrently. The machine proposed here uses the syntactic structure of an FFP expression to guide the embedding of a syntactic network of nodes in the binary tree of machine cells. Execution of the FFP program is accomplished through operations performed by the embedded network of nodes. As new FFP expressions are produced during execution of the FFP program, corresponding new syntactic networks are automatically and dynamically embedded and used for further execution. A syntax tree language for programming the embedded syntactic networks is specified in some detail. Dissert. Abstr.

N82-18879 Royal Signals and Radar Establishment, Malvern (England).
FLEX FIRMWARE
I. F. Currie, P. W. Edwards, and J. M. Foster Sep. 1981 37 p (RSRE-81009; BR81061) Copyright. Avail: Issuing Activity

The instruction set and microcoded aspects of the Flex computer are described. A microprogrammed storage allocation scheme enables the computer to understand procedures. A file store with files of arbitrary structure and mode is possible, based on pointers from the backing store or main store. The data pointed to can contain other pointers. The instruction set facilitates the compilation of high level languages. There is no assembly language. Author (ESA)

N82-18880# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PROGRAMMABLE MULTIPLE DIGITAL CASSETTE MEMORY [MEMORIA MULTIPLA DIGITAL CASSETE PROGRAMAVEL]
Juan Sune Perez Jun. 1981 11 p refs In PORTUGUESE; ENGLISH abstract Presented at the 2nd Natl. Meeting on Automation, Salvador, Bahia, Brazil, Jul. 1981
(INPE-2099-RPE/329) Avail: NTIS HC A02/MF A01

The fundamentals of a peripheral equipment model of the magnetic memory type to be configured in computational systems are proprosed. This peripheral equipment consists, in part, of a microcomputer which was designed and constructed to be employed in the dedicated control of up to eight units of digital cassette memory transports. The model and the operational programming of the controller are also presented. S.L.

N82-18881# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A MICROCOMPUTER FOR CONTROL OF DATA COLLECTION PLATFORMS [UM MICROCOMPUTADOR PARA CONTROLE DE PLATAFORMAS DE COLETA DE BADOS]
Jose Bianchi Neto and E. W. Bergamini Jun. 1981 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 2nd Natl. Meeting on Automation, Salvador, Bahia, Brazil, Jul. 1981
(INPE-2104-RPE/331) Avail: NTIS HC A02/MF A01

A microcomputer developed for application in an environmental data collection platform performs functions of data control, acquisition and processing of a self timed data collection platform compatible with the GOES (satellite) system. Block diagrams are presented and the data collection platform is described. Author

N82-18882# General Accounting Office, Washington, D. C. Mission Analysis and Systems Acquisition Div.
THE WORLD WIDE MILITARY COMMAND AND CONTROL INFORMATION SYSTEM: PROBLEMS IN INFORMATION RESOURCE MANAGEMENT Report to the Congress of the United States
19 Oct. 1981 77 p
(AD-A108454; GAO/MASAD-82-2) Avail: NTIS HC A05/MF A01 CSCL 09/2

GAO's evaluation of the World Wide Military Command and Control Information System modernization effort showed that continuing problems associated with providing automated support for command and control functions are not being properly addressed by DOD. DOD's efforts are not yet completed; however, the methods employed and progress to date are unlikely to enable the replacement of the World Wide Military Command and Control Information System to meet its intended goals. Further, these efforts are proceeding far too slowly to be considered responsive to the need to improve current system performance. DOD anticipates 10 more years will be necessary to modernize the system. GAO's evaluation of the modernization program shows that substantial changes are needed in the program's management structure before the system can be fully and effectively modified. Author (GRA)

N82-18883# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
INVESTIGATION OF LARGE CAPACITY OPTICAL MEMORIES FOR CORRELATOR APPLICATIONS Final Technical Report, 1 Apr. 1978 - 31 Mar. 1981
Kenneth G. Leib and Jay Mendelsohn Oct. 1981 193 p refs
(Contract F49620-78-C-0051; AF Proj. 2305)
(AD-A108555; RE-634; AFOSR-81-0802TR) Avail: NTIS HC A09/MF A01 CSCL 09/2

An investigation of large capacity optical memories was made. The basic memory element, the matched filter, was examined in a number of configurations, including coherent and noncoherent addition, split spectrum, and multiplexed carriers. Three different storage materials were examined: silver halide, dichromated gelatin, and photopolymers. Both thin and thick holographic memories were studied. The matched filters were evaluated using complex terrains such as woodlands, roadsides, and villages in which the principal targets were located. For each terrain and target, the signal to clutter ratio (s/c) was measured. These ranged from 5.5 to 11 dB for the target terrain combinations studied. The complex matched filters that achieved these s/c's were recorded in dichromated gelatin. More than 5 matched filters could be noncoherently added and 15 could be coherently added in the same memory position. Carrier multiplexing could be used to achieve 30 matched filters per memory position. The theoretical limit for memory density of matched filters is 2670 MF/sq cm. Equivalent to 1,000,000 bits of digital data. Modifications of the basic optical matched filter were studied to improve s/c ratio and increase storage density. GRA

N82-18884# Inco, Inc., McLean, Va.
SQL FRONT-END FUNCTIONAL DESCRIPTION
10 Nov. 1981 84 p refs
(Contract N00014-81-C-0808)
(AD-A108508; INCO/UP-1-81-83155-U) Avail: NTIS HC A05/MF A01 CSCL 09/2

The IAIPS (Integrated Automated Intelligence Processing System) SQL Front-End System Functional Description is designed to provide the basis for high-level design specification for system implementation. The outline for this description follows the guidelines specified in the Automated Data Systems Documentation Standards issued in DOD Instruction 7935.1. The Navy's interest in database technology has its foundation in its need to manage and access large amounts of data originating from different sources. The IAIPS program, in support of Naval Intelligence, has the further requirement that this data be available to interactive users in near-real-time. This need is expected to be met, in part, by implementation of the relational database model, ORACLE, which provides a user-oriented interface to the large database currently in use. GRA

N82-18885# Rome Research Corp., N. Y.
LITHO SCANNING TECHNIQUES Final Technical Report, 17 Sep. 1980 - 17 May 1981
Andrew V. Douglas, Thomas V. Edwards, Michael J. Gillote, and Marsha L. Rapke Griffiss AFB, N.Y. RADC Sep. 1981 112 p
(Contract F30602-80-C-0316; AF Proj. 3205)
(AD-A108371; RRC-81-001; RADC-TR-81-229) Avail: NTIS HC A06/MF A01 CSCL 08/2

This effort continued to investigate raster processing techniques, referred to as the Automatic Feature Tracking algorithm, demonstrated to be feasible under previous contract to RADC (F30602-78-C-0313). The current effort considered methods of optimizing the algorithm, determined optimal parameters to track various features, and examined alternate templates for the various features. The goal of this contract was to reduce the processing requirements, and hence the processing time, while preserving the quality of the feature tracking results. In addition to performing the feature tracking, various timing simulations were conducted to demonstrate the processing speed that could be achieved using the existing algorithm and off-the-shelf hardware. The tracking of a symbolized railroad feature could be performed at a rate of approximately ten (10) inches per minute if a computer configuration had the appropriate hardware peripherals. The DeAnza IP-5500 Image Display System and the Floating Point Systems AP-120BF are the devices that could achieve that tracking rate. Alternate hardware was examined with possible changes in the template matching algorithm and the template design to further accelerate processing speed of the feature tracking algorithm.Author (GRA)

N82-18886# CNR, Inc., Needham, Mass.
WIDEBAND HF CHANNEL ANALYZER Final Technical Report, Mar. 1979 - Jan. 1981
George E. Peo and Phillip A. Bello Jan. 1981 56 p
(Contract N00173-79-C-0090)
(AD-A108694) Avail: NTIS HC A04/MF A01 CSCL 14/2

This document is a final report describing a wideband (1 MHz) HF channel analyzer. The Wideband HF Channel Analyzer is a digital signal processor designed to be used for wideband high-frequency radio channel measurement studies. The analyzer contains analog-to-digital converters, a digital pre-processor, a digital correlator array, a digital post-processor and two computer interfaces. To perform a channel measurement experiment, a transmitter at a remote site broadcasts a pseudo-random number (PN) sequence modulated onto a suitable carrier. After complex demodulation at the receiver, the analyzer measures channel delay by correlating the received sequence with its internal reference. Two modes of operation are provided. The Sounder Mode is used to obtain a preliminary characterization of the channel. The Prober Mode is used to more accurately measure the channel delay characteristics. Author (GRA)

N82-18887# Maryland Univ., College Park. Inst. for Physical Science and Technology.
A QUANTITATIVE EVALUATION OF THE FEASIBILITY OF, AND SUITABLE HARDWARE ARCHITECTURE FOR, AN ADAPTIVE PARALLEL FINITE-ELEMENT SYSTEM
Pamela Zave and George E. Cole, Jr. Sep. 1981 46 p refs
(Contract N00014-77-C-0623)
(AD-A108492; BN-971) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper describes an experimental implementation of a design for an adaptive, parallel finite-element system. The implementation was used to simulate the performance of this design on several microprocessor-based multiprocessor architectures. We conclude that it will be possible to build hardware/software finite-element systems which exploit data segmentation to achieve flexibility, modularity, and the ability to process very large problems. Author (GRA)

N82-18888# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTED SENSOR NETWORKS Semiannual Technical Summary, 1 Oct. 1980 - 31 Mar. 1981
Richard T. Lacoss 31 Mar. 1981 71 p
(Contract F19628-80-C-0002; ARPA Order 3345)
(AD-A108275; ESD-TR-81-210) Avail: NTIS HC A04/MF A01 CSCL 17/1

This Semiannual Technical Summary reports work in the Distributed Sensor Networks program for the period 1 October 1980 through 31 March 1981. Status of the development and deployment of the DSN acoustic test bed and implementation of a real-time DSN capability using the test bed are reported. DSN communication requirements have been reviewed and a preliminary design has been completed for a communication channel structure and for protocols to provide the needed services. Simulation and analytical results have been obtained confirming the performance of the proposed distributed random-access scheme for local broadcast. Progress is reported on design studies directed toward an advanced nodal processor and software design and development efforts directed toward solving problems associated with distributed software systems. Author (GRA)

N82-18889# Oklahoma State Univ., Stillwater. Electronics Lab.
AUTOMATED PCM ENCODER TEMPERATURE TEST
J. W. Spears 15 Aug. 1981 40 p
(Contracts F19628-81-C-0079; F19628-78-C-0033; AF Proj. 7659)
(AD-A108184; SR-1; AFGL-TR-81-0204) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes an automated method for testing PCM encoder for performance through use of microcomputer control and analysis of the test results. The microcomputer sequentially applies to known test input voltage to various inputs of the

encoder under test, analyzes the digitally encoded signals from the encoder for a large number of samples, and provides a printout of the test results. A description of computer software and interface hardware necessary for the test is included.
Author (GRA)

N82-18890# California Univ., San Diego. Center for Human Information Processing.
THE DESIGN OF AN INTERFACE TO A PROGRAMMING SYSTEM AND MENUNIX: A MENU BASED INTERFACE TO UNIX (USER MANUAL)
Gary Perlman Nov. 1981 19 p refs
(Contract N00014-79-C-0323; NR Proj. 157-437)
(AD-A108929; Rept-8105) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report consists of two papers on MENUNIX, an experimental interface to the programs and files on the UNIX operating system. In the first paper, I discuss how the decisions about the design of MENUNIX were made: based on my intuitions and user comments, but also on psychological theory and data whenever available. MENUNIX presents both the programs and files of UNIX in two menus from which users can make selections with single keypresses. The FILE menu presents the UNIX file hierarchy that allows users to organize files into directories by subject (e.g., writing and programming). The PROGRAM menu presents UNIX programs in a hierarchy organized into workbenches according to the tasks for which they are used (e.g., writing and programming) much as files can be organized in directories. Special facilities are provided for: finding out about useful commands; using variables to set options, to save commands, and to avoid typing long strings; and for editing strings (including recent commands). The second paper is a tutorial user manual for MENUNIX, in which the features of the program are more fully explained. Author (GRA)

N82-18891# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
A RE-USABLE CODE GENERATOR FOR PRIME 50-SERIES COMPUTERS
T. Allen Akin Aug. 1981 40 p refs
(Contract N00014-79-C-0873; GIT Proj. G36-643)
(AD-A108820; GIT-ICS-81/16) Avail: NTIS HC A03/MF A01 CSCL 09/2

This thesis describes the design and implementation of a language-independent reuseable code generator for Prime 400 and 50-Series computers. A code generator is the portion of a compiler that converts an internal representation of the semantics of a program into equivalent machine code. Construction of a code generator requires a major effort, so it should be done as infrequently as possible. One way to make this possible is to build a code generator that may be re-used from compiler to compiler. Several factors influence the design of such a code generator, including the nature of the communications channel between the code generator and the rest of the compiler, the structure of the information passed to the code generator (the 'intermediate form'), the form of output code desired, and finally the limitations of the machine architecture and existing systems software. The code generator implemented processes a high-level, tree-structured intermediate form, performing translation by case analysis and optimization by eliminating redundant load operations. It produces a stream of assembly language source code which may then be assembled, loaded, and executed. Experience with two compiler implementations has shown that the reusable code generator approach is feasibile. However, several improvements in the present code generator would be desirable. Author (GRA)

N82-18892# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
A SIMULATION TOOL FOR DISTRIBUTED DATABASES
Nancy D. Griffeth Sep. 1981 32 p refs
(Contract N00014-79-C-0873; GIT Proj. G36-643)
(AD-A108819; GIT-ICS-81/15) Avail: NTIS HC A03/MF A01 CSCL 09/2

An experimental software tool for simulating the behavior of distributed algorithms is proposed. The primary motivation for developing the tool is to study distributed database algorithms. Also, a classification of techniques presently used for distributed database problems of concurrency control and recovery is presented. This classification will be used to reduce the experimentation necessary to compare the performance of alternative algorithms. The study and development of distributed algorithms in general and distributed database algorithms in particular is behavior of distributed systems. Both intuition and present-day analytical tools are inadequate to characterize their behavior. Another barrier to understanding such algorithms is the complexity of their interaction, due to the potential lack of synchronization between nodes of a distributed system. Finally, it is not yet clear what 'good' behaviors are reasonable to expect from a distributed system. As a result, a multitude of algorithms may exist for solving a single problem, but without more experience and analysis, their behavior cannot be well understood or compared. This report describes an approach to providing the experience necessary for understanding the behavior of these algorithms. Author (GRA)

N82-18893# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
EFFICIENT FACSIMILE COMMUNICATION WITH COMPUTER CONTROLLED MEMORY SWITCHING [WIRTSCHAFTLICHE FERNSCHREIBKOMMUNIKATION MIT RECHNERGESTEUERTER SPEICHERVERMITTLUNG]
Winfried Bochnig and Juergen Matare 1981 13 p ref Reprint from Korrespondenz in Wandel, 1980 p 60-68 In GERMAN
(Contract GS-82/2371)
(MBB-BB-498-81-O) Avail: NTIS HC A02/MF A01

Decision making policies on the installation of a communication system in a large organization are discussed. Cost analysis, feasibility studies of real factors, and quantifiable volumes, which are future oriented ways of thinking are considered. It is shown that 60% of management problems are caused, as a whole or partially, by faulty communications. The steadily growing volumes of written and verbal information and the joint communication field are considered. Installation of a facsimile copying machine is investigated. The technical development and the practical implications of the text telecommunication is reviewed. Transl. by E.A.K.

N82-18894# Federal Compiler Testing Center, Falls Church, Va.
HONEYWELL INFORMATION SYSTEMS, ADVANCED FORTRAN RELEASE 1.1 Validation Summary Report
18 Aug. 1981 12 p refs
(PB82-106014; FCVS78-VSR867) Avail: NTIS HC A02/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Honeywell Level 6 FORTRAN Compiler Version 1.1 (MOD 400 Version 2.1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of disrepancies together with the tests which were failed. GRA

N82-18895# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HEWLETT PACKARD COMPANY HP-3000 SERIES 3, RELEASE A.00.04 INDEXED 1-0 MODULE
2 Sep. 1981 11 p ref
(PB82-106022; FCTC/TR-81/22) Avail: NTIS HC A02/MF A01 CSCL 09B

The FCTC Technical Report for the Indexed I-O module of the Hewlett Packard COBOL II/3000 COBOL Compiler Version A.00.4 (MPE IV Version C.00.01) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This Technical Report is made up of several sections showing the discrepancies found. A companion report (Validation Summary Report CCVS74-VSR810) provides information regarding the validation of the Compiler at the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N82-18896# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HEWLETT PACKARD COMPANY HP-3000 SERIES 3, COBOL 2/3000, RELEASE A.00.04 Validation Summary Report
2 Sep. 1981 50 p
(PB82-106030; CCVS74-VSR810) Avail: NTIS
HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Hewlett-Packard COBOL II/3000 COBOL Compiler Version A.00.04 (MPE IV Version C.00.01) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low-Intermediate level of FIPS PUB 21-1). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18897# Federal Compiler Testing Center, Falls Church, Va. Software Development Office.
DATAPOINT 6600, COBOL 3.4 Validation Summary Report
2 Sep. 1981 38 p
(PB82-106048; CCVS74-VSR830) Avail: NTIS
HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Datapoint 6600 COBOL Compiler Version 3.4 (DOS Version 2.6) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module with X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18898# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
IBM CORPORATION IBM 5280 COBOL, RELEASE 3 Validation Summary Report
1 Sep. 1981 44 p
(PB82-106055; CCVS74-VSR845) Avail: NTIS
HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the IBM 5280 COBOL Compiler Version 3 (IBM 5280 Distributed Data System Version 3.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18899# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
MICROSOFT, MICROSOFT COBOL V4.40 Validation Summary Report
1 Sep. 1981 48 p
(PB82-106063; CCVS74-VSR825) Avail: NTIS
HC A03/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Microsoft COBOL Compiler Version 4.40 (CP/M Version 1.3) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18900# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS, COBOL, VERSION 3.0 Validation Summary Report
24 Aug. 1981 64 p
(PB82-106071; CCVS74-VSR865) Avail: NTIS
HC A04/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the Honeywell Level 6/57 COBOL Compiler Version 3.0 (GCOS MOD 400 Version 2.1) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18901# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
FRONTIERS IN DATA STORAGE, RETRIEVAL AND DISPLAY. PROCEEDINGS OF A MARINE GEOLOGY AND GEOPHYSICS DATA WORKSHOP
Allen M. Hittelman, ed. Jun. 1981 150 p refs Proceedings of a Marine Geology and Geophys. Data Workshop, Boulder, Colo., 5-7 Nov. 1980 Sponsored in part by NSF, Washington, D.C.
(PB82-100892; NOAA-81071501) Avail: NTIS
HC A08/MF A01 CSCL 09B

Creative ways of meeting the challenges facing the marine data managers were explored. Data are being collected in greater quantities, more sophisticated techniques are being used, the numbers of users and applications are growing, better hardware and software for data handling are becoming available, and there is a great responsibility for applying these data to solve the environmental and resource problems of the nation. GRA

N82-18902# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
IBM CORPORATION: IBM 5280 COBOL, RELEASE 3, INDEXED 1-O MODULE, LEVEL 1
1 Sep. 1981 10 p ref
(PB82-100934; FCTC/TR-81/23) Avail: NTIS
HC A02/MF A01 CSCL 09B

The FCTC Technical Report for the Indexed I-O Module of the IBM 5280 COBOL Compiler Version 3 (IBM 5280 Distributed Data system Version 3) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This Technical Report is made up of several sections showing the discrepancies found. A companion report (Validation Summary Report CCVS74-VSR845) provides information regarding the validation of the Compiler at the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21.1). GRA

N82-18903# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
IBM CORPORATION: IBM vs FORTRAN RELEASE 1 (5748-F03) Validation Summary Report
1 Sep. 1981 12 p
(PB82-100942; FCVS78-VSR871) Avail: NTIS
HC A02/MF A01 CSCL 09B

The Validation Summary Report (VSR) for the IBM VS FORTRAN Compiler Version 1 (5748-F03) (MVS Version 3.8) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.23-1978). The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies; a section relating the categories of discrepancies to the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N82-18904# Federal Compiler Testing Center, Falls Church, Va. Software Development Office.
MICROSOFT: MICROSOFT COBOL V4.40, INDEXED I-O MODULE, LEVEL 1
1 Sep. 1981 10 p ref
(PB82-100959; FCTC/TR-81/24) Avail: NTIS HC A02/MF A01 CSCL 09B

The FCTC Technical Report for the Indexed I-O Module of the Microsoft COBOL Compiler Version 4.40 (CP/M Version 1.3) provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This Technical Report is made up of several sections showing the discrepancies found. A companion report (Validation Summary Report CCVS74-VSR825) provides information regarding the validation of the Compiler at the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-18905 Ohio State Univ., Columbus.
SELECTING SUFFICIENT SETS OF TEST PATHS FOR PROGRAM TESTING Ph.D. Thesis
Steven Joseph Zeil 1981 143 p
Avail: Univ. Microfilms Order No. 8129127

Many strategies for testing computer programs require the selection of a set of paths along which testing will be conducted. Ideally, a finite set of paths would be chosen, sufficient to detect any error in the program construct being tested. The problem of finding such a set of paths is unsolvable. The existence of such a set cannot be guaranteed. However, when the set of possible functions forms a vector space, it may be possible to characterize the set of errors which escape detection for a given test path. Such a characterization permits the comparison of candidate paths for use in testing, and guarantees the existence of a finite sufficient set of test paths. If predicate interpretations are guaranteed to be linear functions, then the number of paths required to reliably test any predicate is no larger than $m + n$, where m is the number of inputs to the program and n the umber of variables. If the set of program computations is linear, then no more than $n(m + n + 1)$ paths would be required to test a block of computations. These characterizations provide a theoretically rigorous means of evaluating proposed test paths.
Dissert. Abstr.

N82-18906 Duke Univ., Durham, N. C.
NUMERICAL TECHNIQUES FOR INVERSE PROBLEMS Ph.D. Thesis
Charles Mark Aulick 1981 97 p
Avail: Univ. Microfilms Order No. 8129834

An overview of three major categories of inverse problem solution techniques, and a common framework in which to compare and analyze them is presented. A finite-dimensional, discrete model which may prove useful in describing many types of inverse problems in different application areas is examined. Once an inverse problem has been reduced to solving the matrix equation Fh = sigma where F and sigma are given, and sigma is subject to measurement error, various techniques may be used to define and calculate a solution. Regularization is one method which may be used. An approach is formulated for generating regularizing functions, from which many different classical methods may be shown to be derivable in a simple fashion. A statistical approach may be used to solve the problem, by viewing the vectors h and sigma as random vectors. Another approach is to restrict the solution space, which may be thought of as finite Fourier analysis. Dissert. Abstr.

N82-18907 Ohio State Univ., Columbus.
A METHODOLOGY FOR THE EVALUATION OF LANGUAGES FOR THE DEVELOPMENT OF INFORMATION SYSTEM PERFORMANCE MODELS Ph.D. Thesis
Jan Alexander Aitken 1981 211 p
Avail: Univ. Microfilms Order No. 8128951

A strategy was developed which can be used to assist the information system analyst/modeler in evaluating alternative languages for use in developing performance models of computer-based information systems and in choosing the most appropriate language based on the applicability of language capabilities to problem modeling requirements and the availability of modeler skills and resources. The language evaluation strategy provides: (1) approaches to the characterization of the modeling requirements of a particular information system design/analysis problem, the modeler resources available to perform the modeling task, and the features and capabilities of a modeling language relative to its support for information system modeling; (2) measures for language evaluation; and (3) a methodology for evaluating candidate modeling languages based on their applicability to particular information system modeling requirements.
Dissert. Abstr.

N82-18908 California Univ., Berkeley.
SYNTAX ORIENTED ANALYSIS OF THE RUN TIME PERFORMANCE OF PROGRAMS Ph.D. Thesis
Luis Felipe Cabrera 1981 206 p
Avail: Univ. Microfilms Order No. 8200042

The problem of finding efficient ways to determine, given the values for the input variables, the values of various performance indices associated with a program is investigated. The dynamic profile of the program is reproduced. Using the profile together with a data base of program performance information enables us to find the actual values of most of the desired performance indices. Several kinds of performance representations of programs are described which express the profile equations of the program. It is shown that it is possible to represent the profile equations by program performance formulae, whose evaluation time is linear in the length of their expressions. This is easily seen to be the best one can hope to obtain. It is seen that for compute bound sequential programs, the running time of the skeleton can be substantially shorter than that of running an instrumented version of the original program. Examples are presented which show that the running time of the skeleton need not be linear in the length of its text and in some cases is very close to the running time of the actual program. Dissert. Abstr.

N82-18909 Texas Univ. at Arlington.
TWO APPROACHES TO DEADLOCK IN DISTRIBUTED SYSTEMS Ph.D. Thesis
Laura Myers Haas 1981 76 p refs
Avail: Univ. Microfilms Order No. 812863

Deadlock occurs when a set of processes is unable to proceed because each process needs to communicate with another member of the set, and no two processes in the set are waiting to communicate with each other. Two possible approaches to deadlock, detection and prevention are investigated. In the area of detection, a distributed deadlock detection algorithm is proposed. The algorithm is proven correct. It is proven both to detect all deadlocks which might occur and not to falsely detect deadlocks which do not exist. The algorithm applies the Dijkstra-Scholten algorithm for detecting termination of diffusing computations over static graphics to the dynamic structure of a wait for graph. In the area of prevention, a methodology for using a deadlock absence proof technique is developed.
Dissert. Abstr.

N82-18910 Illinois Univ. at Urbana-Champaign.
THE HUMAN AS A CONSTRAINED OPTIMAL TEXT EDITOR Ph.D. Thesis
John Maynard Hammer 1981 89 p
Avail: Univ. Microfilms Order No. 8127600

The editing of thirty users--ten on each of three editors--was collected by monitoring all terminal input and output. The data was divided into a derivation and a validation data set. The ten different users' problems in the derivation data were solved with the constrained optimal model. Keystrokes in excess of this solution were categorized as feedback requests, inappropriate command selection, or human error. These categories were iteratively refined and then frozen for analysis of the validation data. The model--a constrained optimal solution plus the descriptive categories--explained 85 to 95 percent of the keystrokes in both data sets. Significant differences among editors

were found in the percentage of keystrokes due to feedback requests and in the ratio of optimal to constrained optimal performance. In addition, several recommendations were developed for improving the human factors of text editors.
Dissert. Abstr.

N82-18911 Michigan Univ., Ann Arbor.
COMPUTATIONAL MODELING OF EVOLUTIONARY LEARNING Ph.D. Thesis
Roberto Raul Kampfner 1981 182 p
Avail: Univ. Microfilms Order No. 8125143

A conceptual model of evolutionary learning in the brain, namely, M. Conrad's evolutionary selection circuits model, is studied using a constructive experimental approach involving computational modeling and simulation. In the conceptual model, networks of formal (enzymatic) neurons develop adaptations based on a process similar to evolution by variation and selection. The behavior of such networks can be changed by modifying the firing properties of the neurons they contain. The firing properties of such neurons are controlled by macromolecules (called excitases) which catalyze events leading to impulse formation in response to specific patterns of dendritic inputs. A basic version of the learning algorithm was developed which yields an effective performance. Simulation experiments on the learning of pattern classification tasks indicated that single neuron networks learn this type of task more efficiently than redundant networks do. Some simulations indicated that learning tasks interpreted as motor control processes are handled efficiently by the learning algorithm.
Dissert. Abstr.

N82-18912 Illinois Univ. at Urbana-Champaign.
SELF-CHECKING PROGRAMS: AN AXIOMATIC APPROACH TO THE VALIDATION OF PROGRAMS BY THE USE OF ASSERTIONS Ph.D. Thesis
Ali Mili 1981 190 p
Avail: Univ. Microfilms Order No. 8127645

The development and investigation of a methodology for program design and verification is discussed. The design part is described by a step-wise refinement process. The verification part is described by a set of Induction Rules. The distinguishing feature of this methodology is that it produces programs which are not proven to be correct but to have a property that is weaker than correctness: The Self-Checking Property. The self-checking Property is based on a systematic of assertions and is defined as follows: A program is said to be self-checking if and only if it can be proved that any time it is executed on some input data and all assertions return True when they are checked for, then the output obtained is correct. An example of design and verification of a self-checking program performing Gaussian elimination is shown. It is stressed that very little effort is needed for the verification of its self-checking property.
Dissert. Abstr.

N82-18913 Illinois Univ. at Urbana-Champaign.
TOPICS IN COMPUTATIONAL GEOMETRY Ph.D. Thesis
Kenneth Jay Supowit 1981 187 p
Avail: Univ. Microfilms Order No. 8127711

Analyses of algorithms and complexity results for certain geometrical problems are presented. The problems of finding a minimum weighted matching and a minimum traveling salesman tour of n points in a square in the plane are considered. The performance of certain fast heuristics for these two problems is analyzed. The computation of the relative neighborhood graph of a finite set V of n points in Euclidean space is then addressed. Various geometric covering problems are considered; in particular, problems whose input is a finite set of points in Euclidean space and whose output is a set of balls whose union contains the input points. A heuristic technique is described that can be applied to a wide class of covering problems, among them the smallest bomb problem, the smallest enclosing circular problem, and the largest empty circle problem. Finally, several point covering problems are shown to be NP-hard, including the k-police station problem.
Dissert. Abstr.

N82-18914*# Walla Walla College, College Place, Washington. School of Engineering.
STUDY OF HIGH SPEED COMPLEX NUMBER ALGORITHMS Final Report
Rodney Heisler [1981] 44 p refs
(Contracts NAS5-25994; NAS5-22563)
(NASA-CR-166743) Avail: NTIS HC A03/MF A01 CSCL 09B

A method of evaluating the radiation integral on the curved surface of a reflecting antenna is presented. A three dimensional Fourier transform approach is used to generate a two dimensional radiation cross-section along a planer cut at any angle phi through the far field pattern. Salient to the method is an algorithm for evaluating a subset of the total three dimensional discrete Fourier transform results. The subset elements are selectively evaluated to yield data along a geometric plane of constant. The algorithm is extremely efficient so that computation of the induced surface currents via the physical optics approximation dominates the computer time required to compute a radiation pattern. Application to paraboloid reflectors with off-focus feeds in presented, but the method is easily extended to offset antenna systems and reflectors of arbitrary shapes. Numerical results were computed for both gain and phase and are compared with other published work.
Author

N82-18915*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN AUTOMATED DATA MANAGEMENT/ANALYSIS SYSTEM FOR SPACE SHUTTLE ORBITER TILES
Gary L. Giles and Maria Ballas Jan. 1982 92 p refs
(NASA-TM-83261) Avail: NTIS HC A05/MF A01 CSCL 09B

An engineering data management system was combined with a nonlinear stress analysis program to provide a capability for analyzing a large number of tiles on the space shuttle orbiter. Tile geometry data and all data necessary of define the tile loads environment accessed automatically as needed for the analysis of a particular tile or a set of tiles. User documentation provided includes: (1) description of computer programs and data files contained in the system; (2) definitions of all engineering data stored in the data base; (3) characteristics of the tile anaytical model; (4) instructions for preparation of user input; and (5) a sample problem to illustrate use of the system. Description of data, computer programs, and analytical models of the tile are sufficiently detailed to guide extension of the system to include additional zones of tiles and/or additional types of analyses
A.R.H.

N82-18916# Softech, Inc., Waltham, Mass.
THE JOVIAL (J73) WORKBOOK, VOLUMES 1 THROUGH 6 Interim Report, Dec. 1979 - Oct. 1981
Griffiss AFB, N.Y. RADC Nov. 1981 299 p
(Contract F30602-79-C-0040; AF Proj. 2022)
(AD-A108527; RADC-TR-81-333-Vol-1-2-3-4-5-6) Avail: NTIS HC A13/MF A01 CSCL 05/9

The JOVIAL (J73) Workbook is only one portion of a self-instructional JOVIAL (J73) training course. In addition to the programmed-learning primer/workbooks, are video taped lectures. The workbooks are formatted to consist of fifteen segments bound in three volumes covering each particular language capability. A video tape lecture was prepared for each workbook segment. This course is taught in two parts. Part 1 contains twelve segments in Volumes 1 and 2 of the workbook; Simulation results for a high-low, single-drift X-GaAs IMPATT are presented. The method presented here can be employed for any type of IMPATT device. The pulsed oscillator properties of double-drift IMPATT diode structures are presently being investigated.
Author (GRA)

N82-18917# Softech, Inc., Waltham, Mass.
THE JOVIAL (J73) WORKBOOK, VOLUMES 10 THROUGH 12 Interim Report, Dec. 1979 - Oct. 1981
Griffiss AFB, N.Y. RADC Nov. 1981 306 p
(Contract F30602-79-C-0040; AF Proj. 2022)
(AD-A108528; RADC-TR-81-333-Vol-10-11-12) Avail: NTIS HC A14/MF A01 CSCL 05/9

This workbook is only one portion of a self instructional JOVIAL training course and is intended for use with Tape 10 of the JOVIAL (J73) Video Course. Directives are presented for providing supplemental information to the compiler for module linkage, optimization register control, listing options and other

miscellaneous functions. Each directive is discussed along with its placement. GRA

N82-18918# Softech, Inc., Waltham, Mass.
THE JOVIAL (J73) WORKBOOK, VOLUMES 13 THROUGH 15 Interim Report, Dec. 1979 - Oct. 1981
Griffiss AFB, N.Y. RADC Nov. 1981 121 p
(Contract F30602-79-C-0040; AF Proj. 2022)
(AD-A108529; RADC-TR-81-333-Vol-13) Avail: NTIS HC A06/MF A01 CSCL 05/9

The JOVIAL (J73/C) programming language takes the JOVIAL (J73) language and extends it with features designed primarily for communications programming. These extensions are introduced with specific attention given to items, statements, table declarations, subroutines, built in functions and directives. Exercises are also provided where appropriate. Intended for use with Tape 13 of the JOVIAL (J73) Video Course, the workbook elaborates upon and reinforces concepts and language rules introduced in the video tape. GRA

N82-18919# Performance Measurement Associates, Inc., Vienna, Va.
EFFECT OF AUTOMATIC PROCESSING ON SPECIFICATION OF PROBLEM SOLUTIONS FOR COMPUTER PROGRAMS Technical Report, 1 Sep. 1979 - 1 Mar. 1981
Edward M. Connelly, Robert F. Comeau, and Pamela Johnson Mar. 1981 125 p refs
(Contract N00014-79-C-0739; RR0420901)
(AD-A108570; PMA-81-361) Avail: NTIS HC A06/MF A01 CSCL 09/2

The ability of computer users to specify problem solutions with the help of example solutions was investigated as a function of the user's background and experience, various levels of processing and various levels of problem complexity. Two participant groups (programmers and bookkeepers/accountants) working with three levels of problem complexity and three levels of processor complexity were used. The experiment task employed in this study required specification of a logic for selection of a Navy Task force. The results showed that specification of problem solutions by example-solutions led to low rates of errors-of-commission. Further, the rate of errors-of-omission was significantly affected by the degree of generalization of the example inputs by the automatic processor. The results also suggested that the strategy used in developing the example solutions may be a significant factor in the generation of accurate problem solution specificaions. GRA

N82-18920# Naval Research Lab., Washington, D. C. Computer Science and Systems Branch.
A-7E SOFTWARE MODULE GUIDE Interim Report
K. H. Britton and D. L. Parnas 8 Dec. 1981 36 p refs
(AD-A108649; NRL-MR-4702) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document describes the basic organization of NRL's version of the A-7E onboard flight software. The report describes a structure in which modules have been designed in accordance with the Information Hiding Principle. Because of the larger number of modules that result when this principle is applied, the modules are arranged in a hierarchy. The hierarchy should simplify the task of a maintenance programmer assigned to make a specific modification. The document also describes the principles used in the design of the software. It is intended to be useful both as a guide to the A-7E software and as a model for those developing other software systems. Author (GRA)

N82-18921# Maryland Univ., College Park. Dept. of Computer Science.
A HEURISTIC FOR DERIVING LOOP FUNCTIONS
Douglas D. Dunlop and Victor R. Basili Oct. 1981 54 p refs
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A108660; TR-1115; AFOSR-81-0793TR) Avail: NTIS HC A04/MF A01 CSCL 09/2

The problem of analyzing an initialized loop and verifying that the program computes some particular function of its inputs is addressed. A heuristic technique for solving these problems is proposed which appears to work well in many commonly occurring cases. The use of the technique is illustrated with a number of applications. A hierarchy of initialized loops is suggested which is based on the 'effort' required to apply this methodology in a deterministic (i.e., guaranteed to succeed) manner. It is explained that in any case, the success of the proposed heuristic relies on the loop exhibiting a 'reasonable' form of behavior. An informal categorization of such programs is made which is based on two opposing problem solving strategies. It is suggested that our heuristic is naturally suited for use on programs in one of these categories. Author (GRA)

N82-18922# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
A PROGRAM TESTING ASSISTANT
David Chapman Nov. 1981 25 p refs
(Contract N00014-80-C-0505)
(AD-A108147; AI-M-651) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper describes the design and implementation of a program testing assistant which aids a programmer in the definition, execution and modification of test cases and executes them automatically when appropriate. It modifies test cases to preserve their usefulness when the program they test undergoes certain types of design changes. The testing assistant acts as a fully integrated part of the programming environment and cooperates with existing programming tools, including a display editor, compiler, interpreter, and debugger. Author (GRA)

N82-18923# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CARRIER RECOVERY SYSTEM FOR MODEM APPLICATIONS WITH DIGITAL PROCESSING USING PSK OR DPSK MODULATION [SISTEMA DE RECUPERACAO DE PORTADORA PARA APLICACAO EM MODEMS COM PROCESSAMENTO DIGITAL UTILIZANDO MODULACAO DOS TIPOS PSK DU DPSK]
Leon Lonneux, Mario Mammoli, and Eduardo Whitaker Bergamini Jun. 1981 12 p Presented at the 2nd Natl. Automation Meeting, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2095-RPE/325) Avail: NTIS HC A02/MF A01

A conventional digital processor, programmed with efficient algorithms, can be used as specialized signal processors which present a high degree of integration. Block diagrams of a PSK modulator and demodulator, and the basic algorithms utilized in the recovery of the signal carrier are presented. S.L.

N82-18924# Fiorello, Shaw and Associates, Vienna, Va.
ANALYZE USER GUIDE Final Report
Sep. 1981 113 p refs
(Contract DE-AC01-80EI-11975)
(DE82-001323; DOE/EIA-11975/T2) Avail: NTIS HC A06/MF A01

ANALYZE is an interactive system for analyzing models built for input to mathematical programming systems. Specifically, ANALYZE was designed to assist analysts in managing large-scale linear programming models. In addition to permitting examination and detection of error conditions in LP models that might lead to infeasibilities, ANALYZE can tell the analyst what information was put in the model, and what results are implied by the information in the model. This manual describes the commands available in ANALYZE, key algorithms used by the system, and descriptions of system usage. DOE

N82-18925# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN APPLICATION OF PARALLEL COMPUTATION TO SEQUENTIAL COMPUTATION: THE PROBLEM OF COST-EFFECTIVE RESOURCE ALLOCATION
Nimrod Megiddo (Tel-Aviv Univ.) Mar. 1981 14 p refs
Sponsored in part by Control Data
(PB82-108739; TWISK-202) Avail: NTIS HC A02/MF A01 CSCL 09B

A class of problems is demonstrated where good parallel algorithms become useful for designing efficient sequential algorithms. In particular, Valiant's parallel sorting algorithm is applied in the design of an algorithm for the problem of cost-effective resource allocation. GRA

N82-18926# National Bureau of Standards, Washington, D.C. Center for Programming Science and Technology.

PROCEEDINGS OF THE NBS/IEEE/ACM SOFTWARE TOOL FAIR Final Report
Raymond C. Houghton, Jr., ed. Oct. 1981 241 p refs Fair held at San Diego, Calif., 10-12 Mar. 1981; sponsored by IEEE Computer Soc. and SIGSOFT ACM
(PB82-112392; NBS-SP-500-80; LC-81-600109) Avail: NTIS HC A11/MF A01 CSCL 09B

Presentations made by each demonstrator at the San Diego Tool Fair are summarized. The San Diego Tool Fair was a first-of-its-kind demonstration of software engineering tools at a major conference. Each summary includes a short description of the tool, a scenario of the demonstration, a list of references, background on the demonstrators, sample output, and a page of miscellaneous data obtained from the NBS Software Tools Database. The appendix provides a cross reference to the features of the tools. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N82-18927 Dayton Univ., Ohio.
SYSTEM CONTROL PROCEDURE DEVELOPMENT FOR A DISTRIBUTED MICROCOMPUTER NETWORK FOR AVIONICS UTILIZING A NON-RESPONSIVE TIME-DIVISION MULTIPLEXED BUS AS THE INTER-COMPUTER COMMUNICATION LINK Ph.D. Thesis
Dieter Josef Schiller 1981 310 p
Avail: Univ. Microfilms Order No. 8127850

Commercially available bit slice microprocessors in a totally distributed network are used for avionic systems. By dedicating microcomputers to perform various avionic functions and placing these microcomputers close to the sensors with which they interact, system capability is sharply increased due to parallel processing and reduced bus traffic. The bus loading is further reduced by employing the broadcast mode which permits multiple receivers for each message. The system design philosophy is described along with the detailed description of the bus control interface unit. The flow charts for the normal operation of the local executive, the global executive and the actual code for both executives are presented. Tests were constructed to exercise every possible mode of operation of the executive. A description of these tests is provided. Fault detection and fault recovery procedures are emphasized. Dissert. Abstr.

N82-18928 Pennsylvania Univ., Philadelphia.
PROCEDURE BASED GENERALIZED INTERACTIVE SYSTEMS Ph.D. Thesis
Dan Reed Olsen, Jr. 1981 283 p
Avail: Univ. Microfilms Order No. 8127057

A language for writing interactive systems that are independent of the applications that they service is described. Two general interactive processers were designed based on the GINTAC language. The first is a general expression parser. The command languages of several timesharing systems could be implemented using it. The second interactive processer supports a graphical interaction. It provides automatic menu generation, function button management and automatic user feedback. The picking of objects from a display screen can be used to specify operands for expressions. In addition, it is shown how the strong typing of the expressions can resolve ambiguity that occurs when pointing at heirarchicly defined pictures. This system can be used to implement several graphical applications drawn from the literature. These two systems serve only to demonstrate this technique not to define the full extent of its capabilities.
Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support*.

N82-18929# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OPTIMAL CONTROL OF AN M/G/1 QUEUEING SYSTEM [CONTROLE OTIMO DE UMA FILA M/G/1]
Fernando Augusto Silva Marins and Paulo Renato deMorais Jul. 1981 13 p refs In PORTUGUESE; ENGLISH summary Presented at the 14th Brazilian Symp. on Operations Res., Vitoria ES, Brazil, 13-14 Oct. 1981
(INPE-2139-RPE/362) Avail: NTIS HC A02/MF A01

The optimal control of the arrival and service processes of an M/G/1 queueing system is studied. Based on the residual workload, at each instant of time a decision has to be made whether to maintain the facility open and use a determined service rate or to close it and attend the queue at a higher rate. The reward structure includes rewards associated with each one of the two possible services rates and a holding cost proportional to the residual workload. An optimal control policy which maximizes the long run expected average return is investigated. S.L.

N82-18930# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
MATRIX DATA ANALYSIS: COLOR/B AND W CODING IS NOT ALWAYS ENOUGH Interim Report, 1976 - 1981
Marshall B. Faintich 1981 6 p refs
(AD-A108406) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Defense Mapping Agency produces digital data bases that describe the physical appearance of the surface of the Earth. These data bases include, but are not limited to, terrain elevation, culture including landscape characteristics, and vertical features. This data is collected from digitized source maps, from optically or digitally correlated stereopairs of photographic imagery, and from digital multi-spectral sensor data. A dramatic impact has been made in the ability to analyze these digital data bases by applying state-of-the-art digital image technology processing and display concepts. These include a variety of color and/or black and white displays of not only intensity/color coded matrix data, but also image processed data using specialized convolution filters, texture discrimination, and special color representation techniques. In addition, computer generated imagery from these data bases serve as a final analysis tool. Author (GRA)

N82-18931# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
PROFILING SENSITIVITY TO IMAGE QUALITY Final Report
Dennis E. Moellman Oct. 1981 21 p refs
(AD-A108405) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper reports results from a study conducted by the Defense Mapping Agency (DMA) to determine the sensitivity of terrain profiling accuracy to input image quality. The study was accomplished by building a set of stereo test models over a test site; exercising those test models with current instruments; reducing the resultant profile data and comparing the results to existing ground control for the test site. The test models were produced from a single model by repeated steps of photographic enlargement, reduction and resolution degradation. The resultant 25 test models represented all combinations of five specific image scales and resolutions. The instruments were operated in both manual and automatic correlation modes. As a consequence the results portray the interdependence of profile accuracy with both scale and resolution as well as the effects of both manual and automatic profiling. The results also provide insight into the behavior of automatic correlation when approaching and exceeding the instrument's theoretical minimum resolution threshold. Author (GRA)

N82-18932# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.
DISTRIBUTED ARTIFICIAL INTELLIGENCE
Nils J. Nilsson 25 Mar. 1981 13 p refs
(Contract N00014-80-C-0296; SRI Proj. 1350)
(AD-A108734) Avail: NTIS HC A02/MF A01 CSCL 06/4

This report examines a number of advanced military information processing problems that entail computational tasks distributed over space. Communicational restrictions and other factors in these applications make it appropriate to consider

networks of loosely coupled distributed artificial-intelligence (DAI) systems. Among the important conceptual difficulties of designing such networks is the problem of representing and using information about what one part of the network 'believes' about another part. We consider in some detail various aspects of this problem and briefly describe some potential solutions. GRA

N82-18933# SRI International Corp., Menlo Park, Calif. Artificial Intelligence Center.

PLAN SYNTHESIS: A LOGICAL PERSPECTIVE

Stanley J. Rosenchein Mar. 1981 21 p refs
(Contract N00014-80-C-0296)
(AD-A108733) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper explores some theoretical issues of robot planning from the perspective of propositional dynamic logic. A generalized notion of 'progression' and 'regression' of conditions through actions is developed. This leads to a bidirectional single-level planning algorithm which is easily extended to hierarchical planning. Multiple pre/post-condition pairs, complex (conjunctive, disjunctive) goals, goals of maintenance and prevention, and plans with tests are all handled in a natural way. The logical framework is used to clarify gaps in existing 'nonlinear' and 'hierarchical' planning strategies. Author (GRA)

N82-18934# Naval Research Lab., Washington, D. C. Radar Analysis Branch.

A PRF SORTER BASED ON LIST MANIPULATION TECHNIQUES Interim Report

J. O. Coleman 20 Nov. 1981 62 p refs
(XF12151104)
(AD-A108365; NRL-8514) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes a program that uses list processing techniques to sort pulses into sequences uniformly spaced in time, a process referred to as PRF sorting. The detailed discussion of the program's operation is based on a LISP implementation that functions on a demonstration level. A listing of a PASCAL version capable of operation on real data is also given. The unique feature of the algorithm used here is the ability to postpone the decision to assign a pulse to a particular existing pulse train. This is achieved by duplicating the existing pulse train and assigning the pulse to one of the two resulting pulse trains. Both pulse trains are then carried in the system, with equal status, until eventually a decision is made as to which is correct. The list structures used, native to LISP, prevent the duplication of pulse trains from resulting in unreasonable storage requirements. Author (GRA)

N82-18935# Naval Research Lab., Washington, D. C. Systems Research Branch.

ON DIGITAL PROCESSING VIA PDQ FACTORIZATION

P. Bey and C. C. Yang 30 Nov. 1981 14 p refs
(RR0140241)
(AD-A108364; NRL-MR-4669) Avail: NTIS HC A02/MF A01 CSCL 05/8

In this preliminary report, we present a computer program called MAT for implementing the PDQ factorization for digitized images of large pictorial data bases. Within a mini-computer, particular emphasis has been placed on the study of the efficiency of the algorithm in the storage and process of the images.
Author (GRA)

N82-18936# Maryland Univ., College Park. Computer Vision Lab.

SYNTHESIS OF TEXTURES USING SIMULTANEOUS AUTOREGRESSIVE MODELS

R. Chellappa Jul. 1981 36 p refs
(Grant AF-AFOSR-3271-77; AF Proj. 2304)
(AD-A108584; TR-1082; AFOSR-81-0795TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Experimental results of synthesis of some real textures using a class of spatial interaction models known as simultaneous autoregressive (SAR) models are given. The role of statistical inference methods in texture modeling is emphasized.
Author (GRA)

N82-18937# Maryland Univ., College Park. Dept. of Mathematics.

QUALITATIVE TEXTURE DISCRIMINATION

Benjamin Kedem Oct. 1981 31 p refs
(Grant AF-AFOSR-3171-77; AF Proj. 2304)
(AD-A108582; TR-1117; AFOSR-81-0792TR) Avail: NTIS HC A03/MF A01 CSCL 05/8

This paper investigates a set of features termed higher-order crossings for texture analysis. A general discrimination procedure is proposed based on statistics derived from sequential linear filters followed by a clipping operator, and the usefulness of this procedure in discrimination of texture fields is demonstrated. Author (GRA)

N82-18938# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.

COMPUTATIONAL APPROACHES TO IMAGE UNDERSTANDING

Michael Brady Oct. 1981 189 p refs
(Contract N00014-80-C-0505)
(AD-A108191; AI-M-653) Avail: NTIS HC A09/MF A01 CSCL 09/2

Recent theoretical developments in Image Understanding are surveyed. Among the issues discussed are: edge finding, region finding, texture, shape from shading, shape from texture, shape from contour, and the representations of surfaces and objects.
GRA

N82-18939# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.

A CLOSED QUEUEING NETWORK MODEL FOR MULTI-ECHELON REPAIRABLE ITEM PROVISIONING

Donald Gross, Douglas R. Miller, and Richard M. Soland 30 Jun. 1981 28 p refs
(Contract N00014-75-C-0729)
(AD-A108401; SERIAL-T-446) Avail: NTIS HC A03/MF A01 CSCL 15/5

A closed queueing network model of a two-echelon, repairable item provisioning system is presented. It is desired to find the capacities of the base and depot repair facilities as well as the spares level which together guarantee a specified system service level at minimum cost. The stochastic process and the optimization procedure are of interest. Author (GRA)

N82-18940# Carnegie-Mellon Univ., Pittsburgh, Pa.

FLEXIBLE PARSING Annual Report, 1 Jul. 1980 - 30 Jun. 1981

Philip J. Hayes and Raj Reddy 12 Oct. 1981 16 p refs
(Contract F49620-79-C-0143; AF Proj. 2304)
(AD-A109076; AFOSR-81-0852TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

In the first phase, the implementation of the FlexP parser was completed according to the design described in last year's annual report, and was evaluated through use in a gracefully interacting interface. This application showed: that FlexP was able to parse both grammatical and ungrammatical input according to a simple grammar of pattern-matching rewrite rules, that the bottom-up approach of FlexP was helpful in the case of ungrammatical input, and that a grammar suitable for use by FlexP could be defined in terms natural to the domain of interaction of the interface. However, the experimental use of FlexP also made it clear that FlexP had certain problems, largely due to the uniform nature of its grammar. In the second phase, the set of design choices on which FlexP was based was reviewed to determine if it was possible to resolve the problems that FlexP had without also losing the desirable aspects of its performance. This review led to the replacement of a single parsing strategy based on linear pattern matching with an approach based on multiple construction-specific parsing strategies. This approach was evaluated in a preliminary way through the construction of two small parsers, CASPAR and DYPAR, and was found to show considerable promise. Accordingly, design based on the same approach was begun for a more complete parser for restricted domain natural languages, and for a parser oriented towards an artificial command language of the type common in interactive user interfaces. GRA

N82-18941# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.

PROCESSING AND CORRELATION OF DIGITALIZED

IMAGES IN A SPECTRAL RANGE [VERARBEITUNG UND LORRELATION VON DIGITALISIERTEN BILDERN IM SPEKTRALBEREICH]
Hermann Widjaja and H. Rainee Grundmann 14 Aug. 1981 8 p In GERMAN Presented at Colloq. on Theorie und Anwending der Signalverarbeitung, Aachen, 30 Sep. - 2 Oct. 1981
(MBB-UA-596-81-O) Avail: NTIS HC A02/MF A01

Digital methods to solve problems in direct correlations and correlation through two dimensional FFT were examined. Two dimensional signal processing consists of the correlation of two gray tone pictures, which take distinctively different positions, and have different measurement and orientation characteristics. These problems are often solved by real time conditions which occur in many different situations like: conveyor belts automation by industrial robots, signal recognition, tracking of moving objects, plotting from aerial photography, and image processing in medicine. E.A.K.

N82-18942# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 5.
MAN/COMPUTER COMMUNICATION: FROM ARTIFICIAL INTELLIGENCE AND BEHAVIORAL SCIENCE PERSPECTIVES
Lena Linde Oct. 1981 30 p refs
(FOA-C-53005-H2) Avail: NTIS HC A03/MF A01

Literature on artificial intelligence and behavioral aspects of command language interactions and data base systems is reviewed. Computational models of human dialogs, computerized information retrieval, and cognitive models of computerized tasks such as text editing are discussed. Man-computer communication problems are considered from end and miduser perspectives. The difficulty of a formal query language is related to the degree of correspondence between the order of expressing query components in the formal language and the natural cognitive structure of the query components. More planning and knowledge of complex syntactic rules is required for translating an information request into a formal query than for using a command language, e.g., for editing. Author (ESA)

N82-18943# Cambridge Univ. (England). Dept. of Engineering.
ROBUSTNESS IN MULTIVARIABLE CONTROL SYSTEM DESIGN
Anthony Michael Bloch and Ian Postlethwaite 1981 156 p refs
(PB82-121401; CUED/F-CAMS/TR-215-1981;
ISSN-0309-765X) Avail: NTIS HC A08/MF A01 CSCL 12A

The design of linear multivariable feedback systems is examined. The robustness properties of a plant at both its input and output are studied and the ability of these design methods to achieve these important properties are compared. The design methods were applied to several examples of control systems. The robustness properties of a system are those properties due to system feedback. A robust system was good stability and performance properties. In general, a system is robust if good feedback properties are maintained in the face of unstructured uncertainties and perturbations which are not necessarily small, and may be dynamic. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-18944# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A STOCHASTIC APPROACH TO GLOBAL ERROR ESTIMATION IN THE NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS
Atair Rios Neto and Nei Cardoso Cardenuto Dec. 1981 15 p refs Presented at the Symp. and Workshop, Dyn. of Planets Satellites, Sao Paulo, Brazil, Dec. 1981
(INPE-2290-PRE/065) Avail: NTIS HC A02/MF A01

A stochastic scheme is proposed to estimate the order of magnitude of global errors in the numerical integration of ordinary differential equations initial value problems. A Markov stochastic vector sequence is modeled with variances in each discretization time that constrains the order of magnitude of the global error vector components to be within estimated limits with 99% probability. This is done by properly discretizing the dynamic given by the system first order variational equations and by properly perturbing the dynamics with white noise derived from local estimates of truncation and round off errors. The procedure to implement the scheme when Runge-Kutta embedded formulas of two consecutive orders are used is presented. S.L.

N82-18945# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AXISYMMETRIC TRIANGULAR ELEMENT WITH SIX NODAL POINTS
Santiago Alves Tavares and Delma V. Viola Dec. 1981 17 p refs Submitted for publication
(INPE-2289-PRE/064) Avail: NTIS HC A02/MF A01

A stiffness matrix is developed for an axisymmetric problem using triangular elements with six nodal points, in which the region considered may be discretized by means of lines parallel and perpendicular to the axis of symmetry. In order to analyze its behavior, some examples were executed to compare the results with theoretical values. Author

N82-18946 Syracuse Univ., N. Y.
SOLUTION OF LARGE SETS OF LINEAR EQUATIONS USING CELLULAR ARRAYS Ph.D. Thesis
James Walter Fawcett 1981 227 p
Avail: Univ. Microfilms Order No. 8123899

The decomposition of large, sparsely populated sets of linear algebraic equations, using cellular arrays to achieve parallel and pipelined computation of solutions is addressed. Cellular arrays are regular structures of computing and memory elements with fixed and simple modes of communication and control. These structures are used to execute mathematical operations on arrays of data without specifically programming each of the data manipulations, and to carry out these operations at speeds which would be unattainable with sequential processing methods. The performance of alternate efficient solution procedures are examined by complexity and timing analyses. These procedures entail the use of parallel and pipelined computations, and also use structural properties of the equation sets for which solutions are required. Graph theoretic methods are used to examine techniques for extracting a dense substructure from sparse equation models. This allows the cellular arrays to manipulate blocks and bands of data, which contain all of the model nonzeros, much more efficiently than operating on the model as a whole. Dissert. Abstr.

N82-18947 Texas Univ. at Arlington.
AN ERROR ANALYSIS FOR SINGULAR FINITE ELEMENTS Ph.D. Thesis
John Richard OLeary 1981 297 p
Avail: Univ. Microfilms Order No. 8128668

The question of convergence for the finite element method when singular (crack tip) elements are employed in the construction of the approximation subspace is addressed. A-priori and a-posteriori error estimates are developed for a model boundary value defined over a plane domain with a reentrant corner. The a-priori estimates are given in terms of either the global energy norm or the maximum norm over an interior subdomain. This latter sure allows for the development of error estimates on approximations for the strength intensity factor when obtained as an internal degree of freedom for the singular element. Verification of these results is obtained by extensive numerical experiments on a suitably constructed singular ordinary differential equation. The a-posteriori estimate is obtained in terms of a computationally convenient measure suitable for employment in a self-adaptive mesh refinement scheme. Dissert. Abstr.

N82-18948# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CHANGING THE FUZZY RULE OF DETACHMENT
Orion de Oliveira Silva and Celso de Rennae Souza Nov. 1981 16 p refs Proposed for presentation at 12th Intern. Symp. on Multiple Valued Logic, Paris, May 1982
(INPE-2266-PRE/047) Avail: NTIS HC A02/MF A01

It is noted that the fuzzy 'modus ponens' rule has the

counterintuitive property of not reproducing the conclusion when the premise is asserted. A ternary operator is proposed to replace the bounded sum operator (+ in circle), also allowing for a degree of confidence associated with the implication. Another consistent binary operator is proposed, permitting the association of degrees of confidence to premises and conclusion. M.G.

N82-18949# Maryland Univ., College Park. Dept. of Computer Science.

GENERALIZING SPECIFICATIONS FOR UNIFORMLY IMPLEMENTED LOOPS Ph.D. Thesis

Douglas D. Dunlop and Victor R. Basili Oct. 1981 41 p refs
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A108585; TR-1116; AFOSR-81-0791TR) Copyright. Avail: Issuing Activity CSCL 12/1

The problem of generalizing functional specifications for WHILE loops is considered. This problem occurs frequently when trying to verify that an initialized loop satisfies some functional specification, i.e., produces outputs which are some function of the program inputs. The notion of a valid generalization of a loop specification is defined. A particularly simple valid generalization, a base generalization, is discussed. A property of many commonly occurring WHILE loops, that of being uniformly implemented, is defined. A technique is presented which exploits this property in order to systemically achieve a valid generalization of the loop specification. Two classes of uniformly implemented loops which are particularly susceptible to this form of analysis are defined and discussed. The use of the proposed technique is illustrated with a number of applications. Finally, an implication of the concept of uniform loop implementation for the validation of the obtained generalization is explained. Author (GRA)

N82-18950# IBM Watson Research Center, Yorktown Heights, N.Y.

NUMERICAL METHODS FOR STIFF DIFFERENTIAL EQUATIONS AND JOSEPHSON INTERFEROMETER EQUATIONS Annual Technical Report, 1 Jul. 1980 - 30 Jun. 1981

W. Liniger and F. Odeh 14 Aug. 1981 15 p refs
(Contract F49620-77-C-0088; AF Proj. 2304)
(AD-A108373; AFOSR-81-0768TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Results for stiff differential equation include: (1) For all k > or = 1, the (k-1)-parameter family of all A-contractive k-step formulas of order of accuracy p = 2 was derived for variable steps. A-contractive one-leg methods are guaranteed to be stable for the variable coefficient test problem x(dot) = lambda (t)X with any lambda(t), Re lambda(t) < or = 0, and arbitrary step sequences; (2) A stability theorem was proved for A sub 0-contractive one-leg methods applied to diagonally dominant (but not necessarily monotone) nonlinear systems; (3) A procedure was devised for selecting an A-contractive two-step method at every step of the integration in such a way as to minimize a global error bound; and (4) It was shown that the sets of all A-stable and A-contractive formulas with p = k = 2 can be identified by a local analysis in the transfer or time domain pertaining to slowly varying oscillatory solutions. Results on Josephson equations include: (1) The response of an extended junction to a time-dependent quasi-periodic voltage source was studied analytically; (2) The numerical procedure for studying the response of the two-junction inteferometer was modified to increase its accuracy and efficiency. GRA

N82-18951# Massachusetts Inst. of Tech., Cambridge. Lab. of Computer Science.

RESEARCH IN ALGEBRAIC MANIPULATION Final Report, 1980 - 1981

Joel Moses Sep. 1981 4 p
(Grant AF-AFOSR-0250-80; AF Proj. 2304)
(AD-A108603; AFOSR-81-0797TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Research in the past year has concentrated on algorithms for the integration of algebraic functions, these algorithms are being developed. GRA

N82-18952# Naval Research Lab., Washington, D. C. Airborne Radar Branch.

ALGORITHM FOR THE INVERSE OF A HERMITIAN TOEPILTZ MATRIX Interim Report

Karl Gerlach 27 Nov. 1981 18 p ref
(AD-A108357; NRL-8539) Avail: NTIS HC A02/MF A01 CSCL 12/1

New methods for finding the inverse of a Hermitian Toepiltz matrix and the related problem of solving a system of linear equations are presented. Efficient algorithmic procedures for these methods are listed. Author (GRA)

N82-18953# Florida Univ., Gainesville. Center for Mathematical System Theory.

MATHEMATICAL TECHNIQUES FOR NONLINEAR SYSTEM HISTORY Final Technical Report, 1 Jun. 1976 - 31 May 1981

R. E. Kalman Sep. 1981 15 p
(Grant AF-AFOSR-3034-76; AF Proj. 2304)
(AD-A108370; AFOSR-81-0755TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report deals with research results obtained in the following areas: (1) Finite-dimensional linear system theory by algebraic methods--linear systems over a ring, algebraic methods in the study of feedback, polynomial methods for the study of linear systems, F mod G invariant subspaces; (2) Infinite-dimensional linear systems--realization theory of infinite-dimensional linear systems; (3) Nonlinear system theory--basic properties of polynomial (discrete-time) systems and their realization theory; and (4) Identification problems in economics--study of econometric model building. GRA

N82-18954# George Washington Univ., Washington, D.C. Inst. for Management Science and Engineering.

COMPUTABLE OPTIMAL VALUE BOUNDS AND SOLUTION VECTOR ESTIMATES FOR GENERAL PARAMETRIC NLP PROGRAMS

Anthony V. Fiacco Aug. 1981 38 p refs
(Contract N00014-75-C-0729; Grant NSF ENG-79-06104)
(AD-A108229; SERIAL-T-451) Avail: NTIS HC A03/MF A01 CSCL 12/1

A simple technique is proposed for calculating piecewise-linear continuous global upper and lower parametric bounds on the optimal value of nonlinear parametric programs that have a convex or concave optimal value function. This provides a procedure for calculating parametric optimal value bounds for general nonconvex parametric programs, whenever convex or concave underestimating or overestimating problems can be constructed. For the jointly convex program, this approach leads immediately to the construction of a parametric feasible vector yielding a computable and generally sharper nonlinear optimal value upper parametric bound. Connections and extensions of well-known duality results are developed that lead to constructive interpretations of the bounds results and generally sharper nonlinear parametric lower bounds. Author (GRA)

N82-18955# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.

SOME PROPERTIES OF THE NON-LINEAR PARTIAL DIFFERENCE EQUATION FOR THE ISING-MODEL CORRELATION FUNCTION

B. M. McCoy and Tai Tsun Wu Jul. 1980 13 p
(Contract DE-AS02-76ER-03227; Grant NSF DMR-79-08556)
(CNRS-CPT-80-P-1226) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Some basic properties are obtained for the nonliner partial difference equation underlying the spin-spin correlation function of the square two-dimensional Ising model. In particular, a convergent iteractive solution is given for arbitrary boundary conditions, and a version of maximum modulus theorem is derived. DOE

N82-18956# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.

SPONTANEOUS BREAKDOWN OF CHIRAL SYMMETRY IN SEMI-CLASSICAL METHOD. 1: BOUNDARY CONDITION ON THE PATH INTEGRAL

K. Yoshida Jun. 1980 58 p
(CNRS-CPT-80-P-1217) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

It is suggested that the usual path integral representation

of Euclidean vacuum amplitude in QCD must be supplemented by the explicity boundary condition corresponding to the spontaneous breaking of chiral SU(N) x SU(N). The analogy with the quantum mechanical example naturally leads to the trial wave function of Nambu and Jona-Lasinio and this in turn gives the starting point for the self-consistent calculation. DOE

N82-18957# Centre National de la Recherche Scientifique, Marseilles (France). Centre de Physique Theorique.
FEYNMAN PATH INTEGRAL AND POISSON PROCESSES WITH PIECEWISE CLASSICAL PATHS
P. Combe Sep. 1980 30 p refs
(CNRS-CPT-80-P-1244) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The existence of a Feynman integral formula for gentle perturbations of harmonic oscillators is proved. This result is extended to a Bose relativistic theory. DOE

N82-18958# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France). Service Mathematiques Appliquees.
USE OF ANGULAR FINITE ELEMENTS FOR THE NUMERICAL ANALYSIS OF TRANSPORT EQUATION
Christian Lecot Jul. 1980 178 p In FRENCH; ENGLISH summary
(CEA-N-2150) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

The first order transport equation is numerically solved by using a finite element method to treat angular variables. Several properties that the finite element method must satisfy to solve the problem in the simple case of monodimensional geometry are given. Results obtained are compared with those given by two known codes in the case of bidimensional geometry. DOE

N82-18959# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
THEODOR VON KARMAN AND APPLIED MATHEMATICS [THEODOR VOR KARMAN UND DIE ANGEWANDTE MATHEMATIK]
E. A. Mueller May 1981 19 p refs In GERMAN Presented at DGLR's Conf. on the 100th Anniversary of Theodor von Karman, Aachen, 11 May 1981
(MPIS-9/1981; ISSN-0436-1199) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,60

The von Karman mathematical theories and their application to technology are outlined. The following topics are discussed: (1) Karman vortex street; (2) mathematics and technology; (3) mathematical methods in engineering; (4) mechanical similarity and turbulence; (5) mechanics of resistance of a moving body in fluids; (6) stability of two row streets of straight and circular vortices; (7) laminar and turbulent friction; (8) integration of differential equations of the laminar interfaces; (9) resistance of slender bodies moving with supersonic velocities. Transl. by E.A.K.

N82-18960# Hochschule der Bundeswehr, Munich. (West Germany). Forschungsschwerpunkt Simulation und Optimierung.
THE LINE METHOD FOR SOLVING PARTIAL DIFFERENTIAL EQUATIONS ENCOUNTERED IN THE LITERATURE [DIE LINIENMETHODE ZUR LOESUNG PARTIELLER DIFFERENTIALGLEICHUNGEN IN DER LITERATUR]
J. Scherer and K. J. Schwenzfeger Sep. 1981 228 p refs In GERMAN
Avail: NTIS HC A11/MF A01

The numerical analysis of partial differential equations in applied mathematics is discussed. A literature overview of the procedures is presented. Two methods for numerical analysis are the differential and the finite element methods. The nonlinearity equations system is applied for important problems of the unknown. The following methods are discussed: Rothe method; longitudinal method; boundary layer theory; hyperbolic geometry; integral relations method and hyperbolic problems; elliptic functions; integrated for standard differential equations. E.A.K.

N82-18961# European Space Agency, Paris (France).
STABILIZATION OF THE NUMERICAL INTEGRATION OF EQUATIONS OF MOTION Ph.D. Thesis - Tech. Univ. Carolo-Wilhelmina, Brunswick
Wolfgang vonGruenhagen Sep. 1981 131 p refs Transl. into ENGLISH from "Zur Stabilisierung der numerischen Integration von Bewegungsgleichungen" Rept. DFVLR-FB-79-14 DFVLR, Brunswick, Nov. 1979
(ESA-TT-676; DFVLR-FB-79-41) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 24,70

Numerical stability is investigated through the numerical integration of motion equations subject to holonomic secondary conditions. The accuracy of the numerical solution is measured by the error in the energy balance. An example of four oscillations shows that in cases having physical instability, the numerical instabilities can be ignored. In systems with a first integral, the way in which numerical perturbations lead to degradation of this integral are described. In good approximations, the perturbations can be taken as constant. When the explicit transformation of a mechanical system to action and angle variables is possible, the Hamiltonian function can be so manipulated that it is linear in the action variables. The equation of motion that results has stable solutions. The example of free symmetric gyroscopes shows that when all the frequencies of the system except one are functions of elements, a complete stabilization can always be carried out through the homogenous Hamiltonian formalism.
Author (ESA)

N82-18962# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SOME DIRICHLET SERIES WHOSE POLES ARE RELATED TO CUSP FORMS
Dennis A. Hejhal 1981 30 p refs
(Grant NSF MCS-78-27377)
(CTH-Math-1981-14) Avail: NTIS HC A03/MF A01

After a detailed analysis of the general case, results are specialized to the case of PSL (Z, Z). Let Gamma/H be a Fuchsian group with finite non-Euclidean area. Consider Gamma as a discrete subgroup of PSL (Z, the set of all real numbers). It is indicated what happens when the resolvent kernel G sub s is integrated along C sub 1 X C sub Z, the C sub j being certain paths in H closely related to hyperbolic elements. Similar manipulations for the case of parabolic C sub j lead to Dirichlet series involving Kloosterman sums. In either case, the essential point is that Dirichlet series whose singularities are closely related to eigenvalues of the Laplacian for Gamma/H are obtained. The number theoretical content of these general techniques provide insight into what happens when one C sub j is taken to be hyperbolic, the other parabolic. It is evident that the cusp forms for PSL (Z, Z) are intimately related to the distribution properties of (y squared) congruent to D mod L for L tends to infinity.
Author (ESA)

N82-18963# Cambridge Univ. (England). Dept. of Engineering.
SENSITIVITY OF THE CHARACTERISTIC GAIN LOCI
Ian Postlethwaite Apr. 1981 23 p refs
(PB82-113481; CUED/F-CAMS/TR-213-1981;
ISSN-0309-765X) Avail: NTIS HC A02/MF A01 CSCL 12A

It is noted that in the generalized Nyquist stability criterion for linear, time-invariant, multivariable, feedback systems, stability is determined from the characteristic gain loci. The sensitivity of the latter is examined and sets of indices, called sensitivity indices, are introduced which characterize the sensitivity of the loci to small system perturbations. GRA

N82-18964# Cambridge Univ. (England). Dept. of Engineering.
EXISTENCE OF PATCHES BOUNDED BY LINES OF CURVATURE
R. R. Martin 1981 15 p refs
(PB82-114471; CUED/F-CAMS/TR-207-1981;
ISSN-0309-765X) Avail: NTIS HC A02/MF A01 CSCL 12A

The expression for the Gauss-Mainardi-Codazzi equations in terms of arc-length along lines of curvature is derived. Using the frame and position matching method the normal and geodesic curvatures replace the first and second fundamental forms in the surface existence problem. The solution of frame matching for an infinitesimal patch and of position matching for an infinitesimal patch are addressed. M.G.

N82-18965# Cambridge Univ. (England). Div. of Control and Management Systems.
ON CERTAIN CONNECTIONS BETWEEN: INFINITE ZEROS OF PROPER RATIONAL MATRICES, DYNAMIC EQUIVALENCE AND THE INTERACTOR
A. I. G. Vardulakis 1981 22 p refs
(PB82-114513; CUED/F-CAMS/TR-211-1981;
ISSN-0309-765X) Avail: NTIS HC A02/MF A01 CSCL 12A

The infinite zero structure (IZS) of full rank, proper, rectangular (p, x, m) rational matrices is examined. Starting with some algebraic definitions regarding the zeros at infinity (and their degrees) of proper rational matrices, it is shown that the IZS of a proper rational matrix describing a linear multivariable system is invariant under state feedback. The dynamic equivalence class (T(s))S of a proper rational matrix T(s) is then considered. Based on the above result, it is shown that the IZS of T(s) and any other rational matrix within the dynamic equivalance class (T(s))S is fully described by a complete abstract invariant of (T(s))S which is known as the interactor: (Xi sub T)(s) of T(s). The above results allow one to interpret the degrees of the infinite zeros of T(s) with p = or < m as observability indices of an irreducible rational matrix T(s) epsilon (T(s))S. GRA

N82-18966# Cambridge Univ. (England). Dept. of Engineering.
AUTOMATIC ELEMENT REORDERING FOR FINITE ELEMENT ANALYSIS WITH FRONTAL SOLUTION SCHEMES
S. W. Sloan and M. F. Randolph 1981 53 p refs
(PB82-115114; CUED/D-SOILS/TR-109-1981;
ISSN-0309-7439) Avail: NTIS HC A04/MF A01 CSCL 12A

A scheme for obtaining an efficient ordering of elements when using the frontal solution method in finite element computations is described. As an introduction, some basic operation counts for a frontal implementation of Gaussian elimination are derived, and a review of alternative approaches to the problem of deriving efficient numberings is given. Attention is confined to finite element meshes where the number of degrees of freedom for each node is approximately constant. It is shown that efficient element orderings may be obtained by first relabelling the nodes, and then relabelling the elements so that the new nodal elimination order is approximately preserved. The algorithm which is based on a minimum front-growth principle, is shown to be suitable for relabelling the nodes. An algorithm for renumbering the elements automatically in a frontal solution procedure is described in detail, and an illustrative FORTRAN 4 implementation, is given. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-18967 Pennsylvania State Univ., University Park.
THE ANALYSIS OF REPEATED MEASUREMENTS THROUGH TIME Ph.D. Thesis
Philip John Byrne 1981 125 p
Avail: Univ. Microfilms Order No. 8129145

In statistical analyses repeated measures through time on the same experimental unit occur. The assumed structure of a covariance matrix plays an important role in the selection an appropriate test procedure. The first order antedependence model is a model of time dependency which generalizes the first order autoregressive model by relaxing both the assumption of equal variances, and the assumption of equal correlations between all pairs of variables equidistant in time. Several tests regarding the covariance structure are given. Results are subsequently extended to the situation in which a vector of measurements is taken on each experimental unit at each time period.
Dissert. Abstr.

N82-18968 Illinois Univ. at Chicago Circle, Chicago.
MULTI-SAMPLE CLUSTER ANALYSIS AND APPROACHES TO VALIDITY STUDIES IN CLUSTERING INDIVIDUALS Ph.D. Thesis
Hamparsum Bozdogan 1981 147 p
Avail: Univ. Microfilms Order No. 8129898

Multi-sample cluster analysis and clustering individuals are studied from an information-theoretic viewpoint via Akaike's Information Criterion (AIC): where L is the maximized likelihood and m is the number of parameters. This criterion combines the maximum value of the likelihood with the number of parameters used in achieving that value. The multi-sample cluster problem is defined, and (AIC) is developed and proposed as a new procedure for the comparison and identification of various collections of groups, profiles, samples, treatments, experimental conditions, or diagnostic classifications. Univariate and multivariate numerical examples of multi-sample cluster analysis on real data sets are presented and the results are compared with those of conventional multiple comparison procedures. The major computer programs for the Normal Mixture Algorithm (NORMIX) are given for convenience. Dissert. Abstr.

N82-18969 Florida State Univ., Tallahassee.
PARTIAL SEQUENTIAL TESTS FOR THE MEAN OF A NORMAL DISTRIBUTION Ph.D. Thesis
Nasser Reza Arghami 1981 131 p
Avail: Univ. Microfilms Order No. 8125865

Partial sequential procedures for testing a null hypothesis about a normal mean are discussed. A procedure is introduced which reduces the expected sample size for all mean values with considerable reductions for values near the null mean value. Theoretical operating characteristic and average sample number functions are derived, and the empirical distribution of the sample size in some special cases is obtained. Tests for the case of unknown variance and a one sided alternative hypothesis are discussed. A partial sequential test procedure is introduced for hypotheses concerned only with the arithmetic mean. An advantage of this procedure is the fact that the transformed observations follow a central t-distribution as distinct from the noncentral t-distribution. The key element in the procedure is that a number of observations is taken initially before any decision is made; subsequent observations are then taken in batches, the sizes of which depend on the estimate for the variance obtained from the initial set of observations. The ideas developed for the partial sequential t-test are extended to develop tests of hypotheses concerning the parameters of a simple linear regression equation, general linear hypotheses and hypotheses about the mean of special cases of the multivariate normal.
Dissert. Abstr.

N82-18970 Florida State Univ., Tallahassee.
ON SEQUENTIAL UNBIASED AND BAYES TYPE ESTIMATES OF PARAMETERS IN A CONTINGENCY TABLE Ph.D. Thesis
Cheng-Chung Chen 1981 107 p
Avail: Univ. Microfilms Order No. 8125818

Estimation of the probability parameters in a contingency table with linear and/or log linear constrants on the parameters is discussed. Sequential unbiased estimates of the cell probabilities as well as some Bayes posterior mean type estimates are considered. The problem of sequential unbiased estimation of the parameters in a contingency table with linear and/or log linear contraints is addressed. Multinomial Girschick, Mosteller, and Savage type stopping rules are discussed and the corresponding unbiased estimates based on the minimal sufficient statistic described. The problem of sequential unbiased estimation of the probability parameters in the Bradley Terry model of paired comparisons is studied. Two Bayes type procedures for estimating the multinomial cell probability vector p, in the presence of linear constraints on the parameters are proposed and illustrated with examples. A Bayesian approach to the estimation of parameters in the Bradley-Terry model of paired comparisons is considered.
Dissert. Abstr.

N82-18971 Princeton Univ., N. J.
ON SIMPLE ROBUST CONFIDENCE PROCEDURES Ph.D. Thesis
Paul Samuel Horn 1981 500 p
Avail: Univ. Microfilms Order No. 8127748

The use of 't' statistics based on two or four order statistics is explored. The functions of the order statistics used to define the 't' statistics are the hinges. Two 't' statistics based on the hinges are examined. The simpler, pivot-t, is based on two symmetric order statics. The other, bi-pivot-t, uses the hinges

when they each involve two order statistics. For each of the 't' statistics appropriate percentage points are computed using Monte Carlo methods. Conservative confidence intervals are constructed. Criteria are defined and used to assess the performance of the confidence procedures based on the 't' statistics. Poly-efficiencies for the 't' statistics are also given. Pooling (borrowing) of denominators is also examined. New methods of pooling extra information about spread, in addition to the traditional root-mean-square, and their effect on the performances of the 't' statistics is also discussed. M.D.K.

N82-18972 Michigan State Univ., East Lansing.
ON ASYMPTOTIC OPTIMALITY OF BAYES EMPIRICAL BAYES ESTIMATORS Ph.D. Thesis
Tze Fen Li 1981 34 p
Avail: Univ. Microfilms Order No. 8126522

In an empirical Bayes decision problem, a prior distribution Lambda is placed on a one-dimensional family G of priors G sub omega, omega an element of Omega, to produce a Bayes empirical Bayes estimator. The asymptotic optimality of the Bayes estimator is established when the support of Lambda is Omega and the marginal distribution H sub omega have monotone likelihood ratio and continuous Kullback-Leibler information number. For the normal case, a simple class of empirical Bayes estimators is constructed that dominate the James-Stein estimator. Here the Bayes estimator is smooth, admissible and asymptotically optimal on G. The rate of convergence to minimum risk is O/n uniformly on G. The results of a Monte Carlo study are presented to demonstrate the favorable risk behavior of the Bayes estimator in comparison with other competitors including the James-Stein estimator. Dissert. Abstr.

N82-18973 Princeton Univ., N. J.
DATA MODIFICATIONS BASED ON ORDER: PUSHBACK; A CONFIGURAL POLYSAMPLING APPROACH Ph.D. Thesis
Katherine Bell Krystinik 1981 131 p
Avail: Univ. Microfilms Order No. 8126073

Pushback estimates are obtained by a preliminary data modification followed by the application of a simple robust estimate. Monte Carlo results are given for different pushback forms. Some forms are shown to have performance close to 90% of that of good biweights for sample size twenty. For a finite sample size the configural sampling and polysampling approach is presented as a way to achieve: (1) an honest minimum attainable variance for a particular sampling situation; (2) an honest maximum attainable polyefficiency in a particular polysituation; and (3) guidance in the modification of a robust estimate with the aim of increasing its polyefficiency. Estimates are calculated based on the configuration and thus this approach should require fewer samples than traditional Monte Carlo methods. The technique also allows for data from one situation to be used as if it were from each of several situations.
Dissert. Abstr.

N82-18974# Iowa Univ., Iowa City. Dept. of Statistics.
REMARKS CONCERNING CHASE'S RESULTS ON TESTING FOR ORDERED ALTERNATIVES
Tim Robertson and F. T. Wright (Missouri Univ. - Rolla) 10 Oct. 1981 18 p refs
(Contracts N00014-80-C-0321; N00014-80-C-0322)
(AD-A108148; U-of-Iowa-75) Avail: NTIS HC A02/MF A01 CSCL 12/1

Chase (Biometrika (1974)) found a good approximation for the chi-bar-square and E-bar-square distributions for an important special case. These distributions are fundamental to the theory of order restricted tests. Chase had in mind the problem of comparing ordered dose levels with a control and considered the case where there are more observations on the control. He obtained a recursive relation for the limiting values of the coefficients in those distributions as the sample size on the control becomes infinite and the other sample sizes remain fixed and equal. His approximation is the result of an interpolation between critical values in this limiting case and critical values in the case where all the sample sizes are equal. Starting with Chase's formula we derive a sharper recursion relation and table the limiting coefficients. This allows one to determine approximate P-values; to use critical values not included in Chase's tables and to apply these approximations to testing problems where other versions of the chi-bar-square and e-bar-square distributions occur. GRA

N82-18975# University Coll., London (England).
RENEWAL TABLES: TABLES OF FUNCTIONS ARISING IN RENEWAL THEORY
Laurence A. Baxter, Ernest M. Scheuer (California State Univ., Northridge), Denis J. McConalogue (Technische Hogeschool, Delft), and Wallace R. Bilschke (Univ. of Southern California, Los Angeles) Sep. 1981 339 p refs
(Contract N00014-75-C-0733; NR Proj. 042-323)
(AD-A108264) Avail: NTIS HC A15/MF A01 CSCL 12/1

The generalized cubic splining algorithm enables us to evaluate recursively-defined convolutions for a wide variety of distribution functions. The algorithm has been applied to evaluate the renewal function, variance function and the integral of the renewal function for five distributions (gamma, inverse Gaussian, lognormal, truncated normal and Weibull) for a wide range of values of the shape parameter. The results of the computations are discussed and a comparison is made with previous tabulations.
Author (GRA)

N82-18976# Wisconsin Univ. - Madison. Dept. of Statistics.
THE COMPUTATION OF LAPLACIAN SMOOTHING SPLINES WITH EXAMPLES
James G. Wendelberger Sep. 1981 68 p
(Contract N00014-77-C-0675; Grant NAG5-128)
(AD-A108746; TR-648) Avail: NTIS HC A05/MF A01 CSCL 12/1

Laplacian Smoothing Splines (LSS) are presented as generalizations of graduation, cubic and thin plate splines. The method of generalized cross validation (GCV) to choose the smoothing parameter is described. GCV is used in the algorithm for the computation of LSS'S. An outline of a computer program which implements this algorithm is presented along with a description of the use of the program. Examples in one, two and three dimensions demonstrate how to obtain estimates of function values with confidence intervals and estimates of first and second derivatives. Probability plots are used as a diagnostic tool to check for model inadequacy. Author (GRA)

N82-18977# Missouri Univ. -Columbia. Dept. of Statistics.
ON TESTING MONOTONE TENDENCIES
Richard L. Dykstra and Tim Robertson (Iowa Univ.) 30 Oct. 1981 27 p refs
(Contracts N00014-78-C-0655; N00014-80-C-0321)
(AD-A108332; TR-80) Avail: NTIS HC A03/MF A01 CSCL 12/1

In certain problems, it may be expected that a regression function has a substantial overall tendency to be monotone and yet we may not be certain that all of the restrictions imposed by a simple order are satisfied. Distribution theory for liklihood ratio tests of homogeneity of a collection of normal means when the collection is 'decreasing on the average' and for testing 'decreasing on the average' as a null hypothesis, is presented. The restriction 'decreasing on the average' is less restrictive than the usual monotone restriction and allows the data to give rise to 'reversals' over short ranges of values of the parameter set. It is closely related to the 'starshaped ordering' restriction. GRA

N82-18978# Iowa Univ., Iowa City. Dept. of Statistics.
ONE-SIDED COMPARISONS FOR TREATMENTS WITH A CONTROL
Tim Robertson and F. T. Wright 10 Sep. 1981 23 p refs
Prepared in cooperation with Missouri Univ., Rolla
(Contracts N00014-80-C-0321; N00014-80-C-0322)
(AD-A108331; TR-78) Avail: NTIS HC A02/MF A01 CSCL 12/1

Distribution theory for likelihood ratio statistics for the comparison of several treatments with a control is discussed. These test statistics account for prior information that the treatments are at least as effective as the control. It is assumed that the sample sizes on the treatments are (approximately) equal and the sample size on the control is at least as large. Normal means are compared under the assumption of a common variance, either known or unknown. The analogous problem for proportions is also considered. Author (GRA)

N82-18979# Ohio State Univ., Columbus. Dept. of Statistics.
RANKING AND SELECTION IN DESIGNED EXPERIMENTS: COMPLETE FACTORIAL EXPERIMENTALS
Edward J. Dudewicz and Baldeo K. Taneja Oct. 1981 25 p refs
(Contract N00014-78-C-0543; NR Proj. 042-403)
(AD-A108188; TR-210R) Avail: NTIS HC A02/MF A01 CSCL 12/11

Over the years, while it was recognized that development for other designs are of great interest, almost all ranking and selection papers have dealt explicitly with the completely randomized design. What is known in other design settings is reviewed and new results on the complete factorial experimental design are presented. Existing procedures are shown to be vitiated by interaction in such a design. A new procedure which is fully valid even in the presence of unbounded interaction is given. GRA

N82-18980# Ohio State Univ., Columbus. Dept. of Statistics.
OPTIMIZATION IN STATISTICS: AN INTRODUCTION
Jagdish S. Rustagi Oct. 1981 21 p refs
(Contract N00014-78-C-0543; NR Proj. 042-403)
(AD-A108653; TR-249; Rept-9) Avail: NTIS HC A02/MF A01 CSCL 12/1

Optimization techniques play an important role in various areas of statistics. Examples from estimation, nonparametric statistics, design of experiments, sample surveys, multivariate statistical inference, information theory and regression analysis are provided. Author (GRA)

N82-18981# California Univ., San Diego. Dept. of Mathematics.
SMOOTHING SPLINES: REGRESSION, DERIVATIVES AND DECONVOLUTION
John Rice and Murray Rosenblatt Nov. 1981 41 p refs
(Contract N00014-81-K-0003; Grant NSF MCS-79-01800)
(AD-A108631) Avail: NTIS HC A03/MF A01 CSCL 12/1

The statistical properties of a cubic smoothing spline and its derivative are analyzed. It is shown that unless unnatural boundary conditions hold, the integrated squared bias is dominated by local effects near the boundary. Similar effects are shown to occur in the regularized solution of a translation-kernel integral equation. These results are derived by developing a Fourier representation for a smoothing spline. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-18982# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
APPLICATION OF THE ALPHA-BETA PROCEDURE TO DIFFERENTIAL GAMES [UMA APLICACAO DO PROCEDIMENTO ALFA-BETA A JOGOS DIFERENCIAIS]
Julia Leocadia deOliveira, Paulo O. Simoni, and Celso deRennaeSouza Jun. 1981 43 p refs In PORTUGUESE; ENGLISH abstract Presented at the 33rd Ann. Meeting of the SBPC, Salvador, Brazil, 8-15 Jul. 1981
(INPE-2135-RPE/358) Avail: NTIS HC A03/MF A01

Differential games are rewritten as discrete time models, in which the control variables are also discrete and chosen in alternate moves by the two players, using the alpha-beta procedure, generally used in the computer implementation of board games. A relative value V (x sub 1, omega) for the locally optimum game was defined and it was shown that: after l decisions, the difference between states of any two games, started in the same point x, is limited; the difference between the global value of the game and V (x sub 1, omega), is limited. Three differential pursuit games are presented. The results obtained are examined from the point of view of the influence on them of the evaluation functions, and of the search depth. The solutions obtained with the discrete alpha-beta procedure were very close to the analytical solutions, in the two cases where these solutions were known. M.G.

N82-18983# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group: Research Operations.
SUGGESTED MODELS FOR ANALYZING AND FORECASTING DEMAND FOR COMPONENTS OF ARMY VEHICLES
D. J. D. Wijnmalen Sep. 1979 37 p refs In DUTCH; ENGLISH summary
(Contract A78/KL/104)
(PHL-1979-35; TDCK-72841) Avail: NTIS HC A03/MF A01

A computer program concerned with a time series analysis of the demand for vehicle components is described. A number of models are considered which represent common time series patterns, such as trend and seasonal variation. From these models the best fitting model is selected. By extrapolating the fitted model forecasts are made for the demand for vehicle components in one or more future years. The appendices describe the output information of the program and present some results. J.M.S.

N82-18984# Oak Ridge National Lab., Tenn. Engineering Physics Div.
SENSITIVITY THEORY FOR NONLINEAR SYSTEMS. 1: NONLINEAR FUNCTIONAL ANALYSIS APPROACH
Dan G. Cacuci Aug. 1981 30 p refs Sponsored by EPRI
(Contract W-7405-eng-26)
(ORNL/TM-7304; EPRI-RP-1441-1; EPRI-NP-81-19-LD) Avail: NTIS HC A03/MF A01

Concepts of nonlinear functional analysis are employed to investigate the mathematical foundations underlying sensitivity theory. Two alternative formalisms, labeled the forward sensitivity formalism and the adjoint sensitivity formalism, are developed in order to evaluate the sensitivity of the response to variations in the system parameters. The forward sensitivity formalism is formulated in normed linear spaces, and the existence of the Gateaux differentials of the operators appearing in the problem is shown to be both necessary and sufficient for its validity. Although conceptually straightforward and applicable to a considerably wider range of problems, this formalism is computationally expensive to employ. The alternative adjoint sensitivity formalism is considerably more economical from a computational standpoint, but it can only be formulated under more restrictive conditions. In particular, the requirement that operators acting on the state vector and on the system parameters must admit densely defined Gateaux derivatives is shown to be of fundamental importance for the validity of this formalism. DOE

N82-18985# Research Inst. of National Defence, Stockholm (Sweden).
COMPARISON OF U.S. AND SWEDISH AERIAL TARGET VULNERABILITY ASSESSMENT METHODOLOGIES (ATVAM)
Ingrid M. Gyllenspetz and P. H. Zabel 1981 156 p refs Prepared in cooperation with Southwest Research Inst., Houston, Texas
(Contract DAAK11-79-C-0059)
(FOA-Repts-Vol-15-No-4; FOA-B-20034-D8;
ISBN-91-7056-059-5; AMSAA-TR-321-Vol-2) Avail: NTIS HC A08/MF A01; Research Inst. of National Defence, Stockholm Kr 38

The Swedish ATVAM was compared with the more complex American one in order to inprove Swedish detailed techniques and assumptions, thereby obviating extensive tests. The economic advantages of the simpler methodology are considered. Computer models of both countries were applied to a bomber. The largest differences between the models are structural kill (not treated in the Swedish model), fragment penetration capability calculation, and the definition and use of damage criteria. The time needed to describe a target is similar. When the Swedish target description is complete it is also ready to be used against any warhead in the computer program which calculates the kill probabilities. The American model requires three computer runs. The models are so integrated that extensive incorporation of features from the other causes unacceptable increases in complexity. Author (ESA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-18986# Technische Hogeschool, Delft (Netherlands).
A FURTHER INQUIRY INTO THE THEORY OF S-TRANSFOR-

MATIONS AND CRITERION MATRICES Ph.D. Thesis
Martien Molenaar 14 Apr. 1981 85 p refs
Avail: NTIS HC A05/MF A01

A study was initiated into which way the 'Delft techniques' can be applied to photogrammetry. Emphasis was put on methods for error detection in aerotriangulation blocks. Gross data errors prevents the convergence of the solution for block adjustments. Because the mathematical relationships for independent model blocks are relatively simple, study was done for this method of adjustment. A preadjustment error detection method is based on a test of the misclosures of condition equations for observations. The transformation elements for these connections are found as a result of the adjustment. An alternative is the connection of models before adjustment by means of S transformations. Therefore, basepoints are chosen in the overlap of two models to be connected. When both models are transformed to that base, condition equations are formulated for other points in the overlap. This approach is complicated and can be avoided for planimetric independent model blocks. For this case, use of complex number algebra makes a simple elimination of transformation elements possible. S.L.

N82-18987# Pittsburg Univ., Pa. Inst. for Statistics and Applications.
OPTIMIZATION OF FUNCTIONS OF MATRICES WITH APPLICATIONS TO STATISTICAL PROBLEMS Interim Report
C. Radhakrishna Rao Oct. 1981 20 p refs
(Contract F49620-79-C-0161; AF Proj. 2304)
(AD-A108368; TR-81-31; AFOSR-81-0767TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The paper reviews some methods of optimizing functions of vectors and matrices subject to some restrictions and develops techniques for solving them without using the calculus of matrix derivatives. Their application to a number of statistical problems in linear estimation and multivariate analysis is illustrated.
Author (GRA)

N82-18988# Bonn Univ. (West Germany). Inst. of Physikalisches.
WAVE FUNCTION FORMALISMS IN THE CHANNEL COUPLING ARRAY THEORY OF MANY-BODY SCATTERING
F. S. Levin (Brown Univ.) Aug. 1980 35 p refs Sponsored in part by DOE
(BONN-HE-80-15) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Wave function formalisms correponding to different channel coupling array transition operators of many-body scattering theory are derived and discussed. The Kouri-Levin transition operators are seen to be in typical Lippmann-Schwinger (L-S) form and allow for the introduction of wave function components in a particularly straightforward way. The Baer-Kouri transition operators are not in L-S form and an alternate procedure is used to derive their corresponding wave function components. In the three-body case, the Kour-Levin operators T sub (jK) obtained from the Faddeev-Lovelace choice of channel coupling array are seen to lead to precisely the Faddeev wave function components. The Baer-Kouri operators are shown to lead to wave function components obeying inhomogeneous equations. These inhomogeneous equations are used to give an alternate explanation of the non-unitary amplitudes obtained in recent calculations based on approximate forms of the Baer-Kouri operators. DOE

N82-18989# Bonn Univ. (West Germany). Physikalisches Inst.
A MULTI-CLUSTER, N-PARTICLE GENERALIZATION OF THE THREE-PARTICLE FADDEEV WAVE FUNCTION EQUATIONS
F. S. Levin (Brown Univ.) Aug. 1980 43 p refs
(BONN-HE-80-16; ISSN-0172-8733) Avail: NTIS (US Sales Only)HC A03/MF A01; DOE Depository Libraries

It is noted that recent work applying certain forms of many-body scattering theory to problems such as molecular potential energy surfaces and equations for non-equilibrium statistical mechanics indicates that a formulation of the theory based directly on multi-cluster, n-particle, wave function components could be of some utility. Such a formulation is derived using techniques from the Baer-Kouri-Levin-Tobocman and Bencze-Redish-Sloan-Polyzou theories of multi-particle scattering. It is based on components corresponding to the various multi-cluster partitions of an n-particle scattering system and is a generalization of the three-body Faddeev wave function formalism, to which it reduces when n = 3. Except for the full breakup partition, which does not enter the equations, the new components are defined for all possible m-cluster partitions of the n-particles, 2 < or = m < = n - 1. The sum of all the components yields the solution to the Schroedinger equation for scattering and either the Schroedinger equation solution or an easily identified spurious solution in the case of bound states. Both the two-cluster components and two-cluster transition operators are shown to be solutions of equations involving quantities carrying only two-cluster partition labels. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-18990# California Univ., Livermore. Lawrence Livermore Lab.
STANDARD TEST CASE RUNS FOR THE EMPULSE MONOPOLE FIELDSOLVER AND CONDUCTIVITY GENERATION MODEL
Frank W. Chambers and David M. Cox 2 Mar. 1981 60 p refs
(Contracts W-7405-eng-48; N60921-80-WR-W0188; ARPA Order 3178)
(AD-A108739; UCID-19213) Avail: NTIS HC A04/MF A01 CSCL 20/1

At the high current beam propagation workshop it was realized that fieldsolver comparisons between working groups should be made for beams with expanded heads such as develop by blowoff and erosion during propagation. To facilitate comparisons of the fieldsolvers while removing the differences due to evolution of the beam during propagation, standard test cases with imposed beam head profiles were suggested. Hence, unambiguous field and conductivity generation calculation comparisons can be made. The field equations solved for this report are derived elsewhere. The plasma generation model includes a direct deposition term, an avalanche ionization term based on experimental data, and a recombination term. Plasma density is related to a scalar conductivity through the momentum transfer collision frequency. The actual coded fieldsolver used for the results in this report was extracted from the EMPULSE II code. The PHOENIX code was constructed to run this fieldsolver and generate the appropriate diagnostic output. Standard test cases are proposed where the beam current density is prescribed at all points in space. This is accomplished using a simple parameterized profile which can represent a cylindrical beam or one with an eroded nose. Four test cases are proposed; PHOENIX results for these cases are presented. GRA

N82-18991# Naval Research Lab., Washington, D. C.
STEADY STATE NUMERICAL SOLUTION OF MAGNETICALLY INSULATED CHARGE FLOW IN COAXIAL GEOMETRY Interim Report
R. J. Barker and P. F. Ottinger (JAYCOR, Inc., Alexandria, Va.) 8 Dec. 1981 66 p refs Sponsored in cooperation with Defense Nuclear Agency
(Contract ES-77-A-01-6021)
(AD-A108633; NRL-MR-4654) Avail: NTIS HC A04/MF A01 CSCL 20/3

A vectorized, FORTRAN computer program has been written to calculate steady-state electron and ion fluxes as well as radial profiles of the magnetic and electric fields for specific practical radial diode and magnetically insulated vacuum feed line parameters. The numerical formulation is derived in part from the theoretical treatment of the topic by K.D. Bergeron. However, it differs from the treatment in several important respects,

including: a correction in one of the key scaling expressions, a restructuring of the boundary conditions to allow for specific parametric solutions, and a more careful consideration of the regions near the anode and cathode surfaces and near the electron sheath boundary. In deriving these results, analytic approximations for the fields in these 'special' regions were developed. These approximate solutions permitted numerical treatment of the singularities there. Matching the approximations between the regions also provided first-order guesses for the gross steady-state operating characteristics. Author (GRA)

N82-18992# Dayton Univ., Ohio. Magnetics Lab.
HIGH SPEED PERMANENT MAGNET GENERATOR MATERIAL INVESTIGATIONS: RARE EARTH MAGNETS Final Report, 1 Jun. 1979 - 2 Apr. 1981
Herbert F. Mildrum and George A. Graves, Jr. Wright-Patterson AFB, Ohio AFWAL Oct. 1981 140 p refs
(Contract F33615-79-C-2010; AF Proj. 2308)
(AD-A108550; UDR-TR-81-105; AFWAL-TR-81-2096) Avail: NTIS HC A07/MF A01 CSCL 20/3

Permanent magnets with room-temperature energy products of approximately equal to 20-30 MGOe were characterized with a view toward their use in airborne electrical machinery. This report presents the results of an evaluation of commercial sintered rare earth-transition metal magnets potentially suitable for such applications. They include SmCo5, (SmPr)Co5, and modified Sm2Co17, produced by 11 companies worldwide. Extensive magnetic, physical, mechanical, and electrical property engineering data, based on statistically significant numbers of test magnets for each measurement, are presented. Testing procedures, range of evaluation, and test considerations relevant to the application are also identified. Author (GRA)

N82-18993# Illinois Inst. of Tech., Chicago. Dept. of Physics.
THERMAL AND ELECTRICAL PROPERTIES OF SOLIDS AT LOW TEMPERATURES Final Report
Harold Weinstock Sep. 1981 4 p refs
(Contracts DE-AS02-76ER-01629; AT(11-1)-1629)
(DE82-000727; DOE/ER-01629/T1; COO-1629) Avail: NTIS HC A02/MF A01

Information is presented concerning the electrical and thermal conductivity of vanadium; specific heat of palladium; phonon-electron interaction in Pb-Bi alloys; low temperature fast neutron irradiation of A-1S superconductors; and thermal conductivity of damaged MgO. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-18994*# California Univ., Los Angeles. School of Engineering and Applied Science.
THE VELOCITY FIELD NEAR THE ORIFICE OF A HELMHOLTZ RESONATOR IN GRAZING FLOW
Andrew F. Charwat and Bruce E. Walker Mar. 1981 53 p refs
(Grant NsG-3236)
(NASA-CR-168548; UCLA-ENG-81-101) Avail: NTIS HC A04/MF A01 CSCL 20A

Measurement of the time-dependent velocities induced inside and outside the opening of acoustically excited, two-dimensional Helmholtz resonator imbedded in a grazing flow are presented. The remarkably clear structure of the perturbation field which evokes a pulsating source and a coherently pulsating vortex-image pair is described. The simple phenomenological 'lid-model' which correlates the variation in the components of the acoustic impedance with the velocity of the grazing flow is discussed and extended. Author

N82-18995*# Modern Analysis, Inc., Ridgewood, N. J.
STUDY OF CABIN NOISE CONTROL FOR TWIN ENGINE GENERAL AVIATION AIRCRAFT
R. Vaicaitis and M. Slazak Hampton, Va. NASA. Langley Research Center Feb. 1982 147 p refs
(Contract NAS1-16117)
(NASA-CR-165833; MAI-1) Avail: NTIS HC A07/MF A01 CSCL 20A

An analytical model based on modal analysis was developed to predict the noise transmission into a twin-engine light aircraft. The model was applied to optimize the interior noise to an A-weighted level of 85 dBA. To achieve the required noise attenuation, add-on treatments in the form of honeycomb panels, damping tapes, acoustic blankets, septum barriers and limp trim panels were added to the existing structure. The added weight of the noise control treatment is about 1.1 percent of the total gross take-off weight of the aircraft. B.W.

N82-18996*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANNOYANCE CAUSED BY PROPELLER AIRPLANE FLYOVER NOISE: PRELIMINARY RESULTS
David A. McCurdy and Clemans A. Powell Dec. 1981 35 p refs
(NASA-TM-83244) Avail: NTIS HC A03/MF A01 CSCL 20A

The annoyance response of people to the noise of propeller airplane flyovers was examined. The specific items of interest were: (1) the annoyance prediction ability of current noise metrics; (2) the effect of tone corrections on prediction ability; (3) the effect of duration corrections on prediction ability; and (4) the effect of 'critical band' corrections on the prediction ability of perceived noise level. Preliminary analyses of the data obtained from two experiments are presented. The first experiment examined 11 propeller airplanes with maximum takeoff weights greater than or equal to 5700 kg. The second experiment examined 14 propeller airplanes weighting 5700 kg or less. Also included in each experiment were five different commercial service jet airplanes. Each airplane noise was presented at D-weighted sound pressure levels of 70, 80, and 90 dB to subjects in a testing room which simulates the outdoor acoustic environment. Subjects judged 108 stimuli in the first experiment and 132 stimuli in the second experiment. Perceived noise level predicted annoyance better than A, D, or E-weighted sound pressure level. Corrections for tones greater than of equal to 500 Hz generally improved prediction ability for the heavier propeller airplanes. B.W.

N82-18997# Scripps Institution of Oceanography, La Jolla, Calif.
DIFFERENTIAL SOUND ABSORPTION TECHNIQUE AND EFFECT OF ION-PAIRING AND PRESSURE ON SOUND ABSORPTION IN SEA WATER AND AQUEOUS MIXTURES OF MAGNESIUM SULFATE AND SODIUM CHLORIDE Summary Report
Cheng-chih Hsu 1 Nov. 1981 135 p refs
(Contracts N00014-79-C-0472; N00014-80-C-0674; Grant NSF OCE-78-25123)
(AD-A108569; MPL-U-71/81; SIO-REF-81-34) Avail: NTIS HC A07/MF A01 CSCL 20/1

Sound absorption in the ocean between 5 kHz and 350 kHz is principally due to the relaxation process associated with a pressure dependent chemical reaction of MgSO4. This research has resolved two conflicts regarding the effect of pressure on sound absorption and relaxation frequency due to MgSO4 in sea water and the reduction of sound absorption by the addition of up to 0.6 M NaCl to low concentration (0.02M) solution of NaCl. The reduction of absorption in MgSO4 solution upon the addition of NaCl can be accounted for theoretically by Debye-Huckel theory and by formation of MgCl(+) and NaSO4 ion-pairs. The measured reduction is less than that observed by Kurtze and Tamm, however. At this concentration of MgSO4, the effects of ionic strength and ion-pairing are about equal. The results are consistent with disassociation constants of 0.0062, 0.1, 0.178 for the MgSO4, NaSO4(-) and MgCl(+) ion-pairs, respectively up to 0.12 M NaCl addition. For 0.6M NaCl additions to 0.02 M MgSO4, the absorption results cannot be explained by either simple Debye-Huckel theory, the Johnson and Pytkowicz model of ion-pairing nor the Pitzer approach. The values of maximum absorption per wavelength were determined to an absolute accuracy of about 1% from .000080 to .000016. For the differential absorption measurements in MgSO4 and NaCl mixtures, the measurement accuracy is sufficient for quantitative

studies of ion-pairing in electrolyte mixtures, particularly for unsymmetrical salts. GRA

N82-18998# Sparton Electronics, Jackson, Mich.
MODIFIED AMBIENT SEA NOISE INDICATOR WITH AMBIENT NOISE DIRECTIONALITY ESTIMATOR Final Technical Report, 1 Jan. - 31 Aug. 1981
William Ezell 30 Oct. 1981 32 p
(Contract N62269-81-C-0306)
(AD-A108389; SPARTON-7723-A003(F)) Avail: NTIS HC A03/MF A01 CSCL 17/1

The modified Ambient Sea Noise Indicator (ASNI) ID-1872/A MOD which includes an Ambient Noise Directionally Estimator (ANODE) function, provides a comparison of the omnidirectional noise level and the summed noise levels of the two directional channels of a VLAD AN/SSQ-77 sonobuoy when in the ANODE mode. The omnidirectional ASNI absolute noise level can also be read for specific frequencies at the hydrophones of passive omnidirectional sonobuoys without automatic gain control when the modified unit is in the ASNI mode. Passive sonobuoys, located in the sea, will pick up sea noise with pressure-sensitive hydrophones. If the sonobuoy is an AN/SSQ-57, one omnidirectional hydrophone is used. If an AN/SSQ-77 sonobuoy is used, a vertical multielement array of hydrophones provides directional as well as omnidirectional information. The sea noise is transmitted to a receiver in the aircraft. The demodulated signal from the receiver is applied to the indicator. The ASNI and ANODE mode levels are indicated on the front panel meter, which is calibrated in decibels in a 1-Hz band relative to 1 microPascal sq for the omnidirectional noise level and in decibels for the directional channel to omnidirectional channel noise difference. The ambient sea noise levels may be used to plot a graph of ambient sea noise. The ANODE gain may be used to evaluate the effectiveness of the VLAD sonobuoy under various sea states. GRA

N82-18999# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
FRAM 2 SINGLE CHANNEL AMBIENT NOISE STATISTICS
Roger F. Dwyer 25 Nov. 1981 34 p Presented at the 101st Meeting of the Acoust. Soc. of Am. Ottawa (Canada), 19 May 1981
(ZR0000101)
(AD-A108755; NUSC/TD-6583) Avail: NTIS HC A03/MF A01 CSCL 20/1

This document describes the results of a statistical analysis study of FRAM II arctic under-ice ambient noise data. The specific data that were analyzed were recorded on 23-24 April 1980 from a pack ice camp in the Arctic Ocean, located at 86 deg N latitude, 25 deg W longitude. At this location, the bottom depth was approximately 4000 m. The measurement system consisted of a broadband omnidirectional hydrophone, suspended to a depth of 91 m from a sonobuoy located in a lead. Under the influence of arctic currents, the pack ice was slowly moving. This movement caused rifting and cracking of ice, which occurred, at times, throughout the experiments and represented a structured acoustic noise source. Both impulsive and burst noise were identified in the data and were probably created by tensile cracks and rubbing ice masses. GRA

N82-19000# Pennsylvania State Univ., University Park. Applied Research Lab.
EFFECT OF AIR CONTENT ON BROADBAND NOISE MEASUREMENTS IN THE 1.22-m DIAMETER WATER TUNNEL
B. E. Robbins and D. E. Thompson 11 Aug. 1981 18 p
(Contract N00024-79-C-6043)
(AD-A108540; ARL/PSU/TM-81-166) Avail: NTIS HC A02/MF A01 CSCL 20/1

The effect of air content on broadband radiated noise in the 1.22-m diameter water tunnel was investigated. In addition, tunnel operating pressure was also varied. The transmitting hydrophone was positioned in the tail of an axisymmetric body mounted in the test section. Two receiving transducers were used. Both showed a somewhat systematic change in broadband spectral levels with variations in air content up to 11 parts per million and variations in pressure. Author (GRA)

N82-19001# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF THE OUTWARD PROPAGATION OF TIRE NOISE [THEORETISCHE UND EXPERIMENTELLE UNTERSUCHUNGEN ZUR ABSTRAHLUNG VON REIFENLAERM]
O. Bschorr, A. Wolf, and J. Mittmann 30 Apr. 1981 58 p refs In GERMAN
(MBB-BB-483-81-O) Avail: NTIS HC A04/MF A01

Noise propagation caused by tires was measured acoustically. Narrowband analysis shows a linear spectrum which is in complete agreement with the profile grab frequency and harmony. In the zoom spectra unequal profile division caused by sidebands is recognized. The noise propagation caused by body vibration was also measured. The vibration response follows after valve acceleration and deceleration. The real distance and contact free tire surface are free of vibration. The body vibration becomes greater with increased speed, from 30 to 150 m/sec, after which flexural waves stabilize the body. Transl. by E.A.K.

N82-19002# Centre Technique des Industries Mecaniques, Senlis (France).
MEASUREMENT OF THE ABSORPTION PROPERTIES OF ACOUSTIC MATERIALS USED IN THE FABRICATION OF COWLINGS Final Report [MESURE DES PROPRIETES D'ABSORPTION DE MATERIAUX ACOUSTIQUES UTILISES POUR LA REALISATION DE CAPOTAGES]
B. Corlay and G. Delalot Jul. 1981 164 p refs In FRENCH
(CETIM-11-H-285) Avail: NTIS HC A08/MF A01

A wide selection of sound absorbing materials was tested, using the stationary wave tube method, and absorption factors were determined. Results are used to compile a catalog of industrial acoustically absorbant materials which can be employed as interior linings on cowlings for mobile or fixed noisy equipment. Theory that explains the absorptivity of these materials when used alone or in combinations is also presented. Results for low and middle frequency absorption are stressed. Author (ESA)

N82-18146# Southampton Univ. (England).
WIND TUNNEL INVESTIGATION OF HIGH SPEED ROTOR NOISE
H. Tadghighi and I. C. Cheeseman *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 25 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

N82-18148# Westland Helicopters Ltd., Yeovil (England).
PRELIMINARY THOUGHTS ON HELICOPTER CABIN NOISE PREDICTION METHODS
J. S. Pollard *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 14 p refs (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-19003 Texas Univ. at Arlington.
ON THE COMPOSITE STRUCTURE OF ELEMENTARY PARTICLES Ph.D. Thesis
Xerxes Ramyar Tata 1981 192 p
Avail: Univ. Microfilms Order No. 8128697

It is shown that the recombination model associated with modified Kuti-Wiesskopf structure functions provides, within the framework of the quark-parton model, a consistent description of low p sub T particle production in the fragmentation domain of colliding hadrons. The parameters needed to specify the structure functions of the hadrons are all determined from the inclusive single meson production data. The compositeness of particles is then studied from the more fundamental field theoretic point of view. The sense in which a Yakama type interaction may be regarded as equivalent to a four point interaction, with the intermediate boson of the Yakawa theory being regarded as

a composite particle, is examined. Irrespective of the bosonic or fermionic nature of the constituents of the four point interaction, the compositeness conditions do not by themselves, ensure the identity of the two theories. It is further shown that the Yukawa interaction may be made to undergo a transmutation into a four point interaction provided certain spectral contributions that occur in the Yukawa theory are explicity omitted. In view of this, it is suggested that all proofs of the equilvalence of the four fermion theory with the corresponding Yukawa theory need to be reexamined. Dissert. Abstr.

N82-19004 California Univ., Berkeley.
ALIGNMENT SIGNALS FROM ELECTRONS SCATTERING NEAR AN EDGE FOR ELECTRON BEAM MICROFABRICATION Ph.D. Thesis
Yi-Ching Lin 1981 197 p
Avail: Univ. Microfilms Order No. 8200187

The formation of alignment signals from electrons scattering near topographical silicon features both with and without an electron sensitive polymethyl methacrylate resist layer coating was studied theoretically and experimentally. Monte Carlo calculations based on the continuous slowing down approximation were used to generate basic information about electron backscattering from tapered silicon steps. The accuracy of the Monte Carlo approach for the study of electron backscattering was checked in a detailed comparison with available experimental and theoretical results. The effects of beam parameters, mark geometry, resist coating, and the distribution of backscattered electrons in energy and angle on the quality of alignment signals were studied in detail. In many cases, the alignment signals were characterized through the use of universal curves based on simple analytical scattering models. Dissert. Abstr.

N82-19005# Technische Hogeschool, Delft (Netherlands).
TWO-DIMENSIONAL NUCLEAR MAGNETIC RESONANCE IN LIQUIDS Ph.D. Thesis
Adriaan Bax 26 Nov. 1981 211 p refs
Avail: NTIS HC A10/MF A01

The general aspects of two dimensional NMR spectroscopy are treated using a quantum mechanical description and a pictorial example of a two dimensional experiment. The different types of modulation and the consequences for the resultant line shapes are discussed as well as the effect of digital filtering. Chemical shift spectroscopy, J-spectroscopy, and multiple quantum spectroscopy are considered. A number of experiments all having in common the fact that the only signals observed are those from C-13 nuclei coupled to another C-13 nucleus is described. The much stronger signals from isolated C-13 are suppressed using the properties of multiple quantum coherence. The effectiveness of various two dimensional methods for determining particular MNR parameters is evaluated. Computer and spectrometer facilities for performing two dimensional experiments are assessed. A.R.H.

N82-19006# Mission Research Corp., Albuquerque, N. Mex.
BEAM PROPAGATION EXPERIMENTAL STUDY Interim Report
Carl Ekdahl 8 Apr. 1981 24 p
(Contract F49620-81-C-0016; AF Proj. 2301)
(AD-A108504; AMRC-N-167; AFOSR-81-0739TR) Avail: NTIS HC A02/MF A01 CSCL 20/8

The pressure regime for stable propagation of an intense relativistic electron beam (I > 20 kA, W > 1.5 MeV, t > 20 ns) was determined and the beam-current density distribution was measured using an array of fast-response, subminiature Faraday cups. Experiments were performed on the stabilization of this pre-equilibrated beam when it was extracted into full-density air. Author (GRA)

N82-19007# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
ELECTRONIC TRANSPORT IN ULTRATHIN HETEROSTRUCTURES Final Report, 1 Aug. 1978 - 31 Jul. 1981
P. D. Dapkus Oct. 1981 108 p refs
(Contract N00014-78-C-0711)
(AD-A108390; MRDC40129) Avail: NTIS HC A06/MF A01 CSCL 20/7

A detailed study of the optical and electronic transport studies of ultrathin GaAlAs/GaAs heterostructures is reported. The measurements are reported on GaAlAs multiple quantum well heterostructures (MQW) and superlattices (SL) with layer dimension ranging from 200 to 30 A grown by metalorganic chemical vapor deposition (MOCVD). The measurements show that laser emission from these structures lie 36 meV below the absorption edge, consistent with LO phonon emission. The transport properties of modulation doped superlattices and single heterostructures demonstrate enhanced room temperature and low temperature mobility. Author (GRA)

N82-19008# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
GROWTH OF HgCdTe BY MODIFIED MOLECULAR BEAM EPITAXY Semiannual Technical Report, 1 Mar. - 31 Aug. 1981
J. T. Cheung Sep. 1981 43 p refs
(Contract MDA903-79-C-0188; DARPA Order 3704)
(AD-A108750; SC5202.14SA; SATR-4) Avail: NTIS HC A03/MF A01 CSCL 20/7

Thick Hg sub 1-x Cd sub x Te films (> 5 micron were deposited on CdTe sub x (111) A and other substrates by evaporating either (HgTe) sub 1 x/(CdTe) sub x mixture or Hg sub 1-x Cd sub x Te crystals with a pulsed laser. The films were single phase and stoichiometric. All films showed preferential (111) texture. Electrical properties were characterized by Hall measurements, for a x = 0.3 film after annealing, typical values of carrier concentration and mobility were 1-2 x ten to the 17th power/ccm and 3500-6000 sq cm/Vsec, respectively. GRA

N82-19009# Naval Research Lab., Washington, D. C. Plasma Physics Div.
SIMPLE ANALYSIS OF LIGHT ION BEAM LOSSES IN DEUTERIUM PLASMAS CHANNELS
D. G. Colombant and S. A. Goldstein (Jaycor, Inc.) 16 Nov. 1981 29 p refs
(AD-A108287; NRL-MR-4640) Avail: NTIS HC A03/MF A01 CSCL 20/7

Simple analysis of both ion beam energy losses and beam current density reduction is presented for deuterium plasma channels. It is found that whereas an optimum density may exist for reducing the beam energy losses in the channel, no optimum density can be found to minimize the beam current density reduction. Plasma channel radius effects are then examined. It is found that the total ion beam energy loss is not strongly dependent on the initial channel radius. We conclude that final focusing elements in conjunction with channels initially at rest allow for multiterawatt beams to be transported efficiently to 1 sq cm targets while the channel cross-section can be larger. Author (GRA)

N82-19010# Naval Research Lab., Washington, D. C. Beam Dynamics Group.
DYNAMICS OF AN INTENSE ELECTRON RING IN A MODIFIED BETATRON FIELD Interim Report
P. Sprangle, C. A. Kapetanakos, and S. J. Marsh (Sachs/Freeman Associates, Bowie, Md.) 23 Nov. 1981 28 p refs
(RR0110941)
(AD-A108359; NRL-MR-4666) Avail: NTIS HC A03/MF A01 CSCL 20/7

The dynamics of an intense electron ring confined in a modified betatron magnetic field is considered. The analysis assumes that the electron ring is located near the center of a conducting torus and includes self fields, induced fields from the walls surrounding the ring and toroidal effects. It has been found that the geometric center of the ring can perform circular motion around the minor axis of the torus. Based on this analysis, a scheme is proposed for the injection of an intense electron beam into a modified betatron accelerator. Author (GRA)

N82-19011# New York Univ., N. Y. Dept. of Physics.
THEORETICAL INVESTIGATION OF ATOMIC STRUCTURE AND SCATTERING PROCESSES Summary Questionaire Report, Mar. 1981 - Feb. 1982
Larry Spruch and Leonard Rosenberg Nov. 1981 5 p refs
(Contract N00014-76-C-0317; NR Proj. 393-005)
(AD-A108541) Avail: NTIS HC A02/MF A01 CSCL 07/4

The theory of electron-atom scattering in a laser field has been studied and approximation methods applicable to low frequency laser fields have been developed. A study has been made of the dependence of the binding energy of heavy atoms on the atomic number. This is useful in developing generalizations to Thomas-Fermi theory. Author (GRA)

N82-19012# College of William and Mary, Williamsburg, Va. Dept. of Physics.

A STUDY OF THE COLLISIONAL DYNAMICS FOR COLLISIONS OF UF6(-) ATOMS AND MOLECULES Final Scientific Report, 1 Jul. 1980 - 30 Jun. 1981

R. L. Champion and L. D. Doverspike Aug. 1981 26 p
(Grant AF-AFOSR-0227-80; AF Proj. 2301)
(AD-A108419; U4; AFOSR-81-0762TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Absolute total cross sections for the collisional decomposition of the negative ion of Uranium Hexafluoride have been measured for laboratory collision energies up to 500 eV. The results have been analyzed with a statistical theory of unimolecular decomposition. By varying the temperature of the carbon surface upon which the negative ions are created, the average initial internal energy in the negative molecular ion can be selected. Experiments performed with 'hot' negative molecular ions indicate larger decomposition cross sections and lower energy thresholds when compared to results for 'cold' negative molecular ions. Author (GRA)

N82-19013# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.

DYNAMICAL NONLINEAR MATERIAL RESPONSE AND FAILURE Interim Technical Report, Oct. 1979 - Jun. 1981

C. J. Montrose, T. A. Litovitz, D. M. Heyes, Joseph H. Simmons, R. K. Mohr, J. J. Kim, S. D. Grant, and S. M. Rekhson 1 Jul. 1981 136 p refs
(Contracts N00014-75-C-0856; N00014-81-K-0291)
(AD-A108822; CUA/VSL-010781) Avail: NTIS HC A07/MF A01 CSCL 11/2

Molecular dynamics (MD) studies of the nonlinear viscoelastic response of Lennard-Jones model liquid and glassy systems have shown that strain-induced structural changes occur at elevated strain rates and are the microscopic origin of such phenomena as shear (viscosity) thinning and stress overshoot. The structural changes result in a limit to the steady state stress that the material can sustain. In terms of them it was possible to develop a framework for describing ductile failure and the ductile-to-brittle transition. The semi-quantitative agreement of the MD results and primary laboratory studies in organic liquids, polymers and inorganic glasses suggests that the microscopic processes observed in the former are occurring in, and can be used to interpret phenomen in, the latter three. Author (GRA)

N82-19014# Commissariat a l'Energie Atomique, Grenoble (France). Service d'Ionique Generale.

CHARGE TRANSFER CROSS-SECTIONS OF ARGON IONS COLLIDING ON ARGON ATOMS

J. Aubert, S. Bliman, N. Chan-Tung, R. Geller, B. Jacquot, and D. VanHoutte Apr. 1980 13 p refs Presented at the 2nd Conf. on Low Energy Beams, Bath, England, 14-17 Apr. 1980
(CEA-CONF-5209) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A device was built to measure charge changing cross-sections of argon ions colliding on argon atoms. It consists of an E.C.R. ion source (Micromafiios) that delivers argon ions up to charge +13. The ion source potential may be varied from 1 up to 10 kVolts. A first magnet is used to charge analyze the extracted beam. For a given separated charge state, the ion beam is passed in a collision cell whose pressure may be varied. The ions undergoing collisions on the target are analyzed by a second magnet and collected. The pressure is varied in the collision cell in order to check that the single collision condition is satisfied. It is shown that the ions do two types of collisions: charge exchange and stripping whose cross sections are measured. Interpretation of charge exchange is proposed along yet classic theoretical approaches. As to stripping no available theory allows interpretation. DOE

N82-19015# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Dept. of Physique des Particules Elementaires.

STUDY OF INCLUSIVE SEMI-LEPTONIC NEUTRAL CURRENT REACTIONS IN NEUTRINO AND ANTINEUTRINO INTERACTIONS BETWEEN 12 AND 200 GeV Ph.D. Thesis - L'Universite de Paris-Sud

Brigitte Devaux Sep. 1980 170 p refs In FRENCH
(CEA-N-2150) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

Results obtained in a detailed study of neutral current type reactions: antineutrino + Fe (FEMALE) antineutrino + X using the Neutrino Beam of the SPS at CERN are reported. The detector and beam properties lead to a good knowledge of the resolution and contamination sources. Between 12 and 200 GeV, the ratio of the inclusive cross-sections of neutral to charged current reactions is measured to be Rsub (neutrino) = 0.293 + -0.010 and Rsub (antineutrino) = 0.35 + -0.03. Within the experimental errors, there is no significant variation of ratios with the incoming neutrino energy. The space-time structure of neutral current is dominated by the (V-A) component with a non-zero (V+A) term, up to 4.5 standard deviations. Following Weinberg and Salam model, all results are consistent for a value of sin(2) theta(W) = 0.24 + -0.02. Because of the accuracy, it becomes a reference value for that quantity. DOE

N82-19016# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Office des Rayonnements Ionisants.

INVESTIGATIONS ABOUT THE INTERNAL CONVERSION COEFFICIENT FOR TRANSITION ENERGIES NEAR THE THRESHOLD Ph.D. Thesis - L'Universite de Paris-Sud

Nelcy FaraniCoursol Jun. 1980 140 p refs In FRENCH
(CEA-R-5052) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

A detailed review of the different theories concerning internal conversion is made. The principal physical parameters and their influence on the calculated conversion coefficients are presented. The results (experimental and theoretical) obtained for the internal conversion coefficients near the threshold (K shell) for the transitions in the nuclei (57) Fe (M1; 14 KeV), up(125m)Te (M1; 35KeV), up(129)mXe (M4; 39 KeV) and sup(93m)Nb (M4; 30 KeV) are presented with the ICC computations for different types of transitions on the 30 and 80 atomic number nuclei. A comparison is made of the different computations and a discussion points out the penetration effect and hole correction which become important at low energy and for high multipolarities. DOE

N82-19017# Australian National Univ., Canberra. Dept. of Nuclear Physics.

ELASTIC AND INELASTIC SCATTERING MEASUREMENTS FOR THE MG-24 PLUS PB-208 AND SI-28 PLUS PB-208 SYSTEMS

J. S. Eck, T. R. Ophel, P. D. Clark, D. C. Weisser, and G. R. Satchler (ORNL) Oct. 1980 28 p refs Submitted for publication Sponsored in part by DOE and NSF
(ANU-P-788) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The differential cross sections for the elastic and inelastic scattering to the lowest 2(+) states of Mg-24 and Si-28 using Mg-24 and Si-28 beams in conjunction with Pb-20 targets were measured and analyzed. The incident beam energies were 145 MeV for Mg-24 and 162 MeV for Si-28. The measured cross sections were analyzed using coupled channels calculations assuming a rotational model description for the low-lying collective states of Mg-24 and Si-28. The coupled channels calculations are compared with polarization potential calculations in which the experimental B(E2) values are used in both cases. The extracted deformation lengths and deformation parameters are compared to those obtained using similar data with light projectiles, although because of strong Coulomb excitation the present calculations are fairly insensitive to the nuclear deformation parameters. DOE

N82-19018# Australian National Univ., Canberra. Dept. of Nuclear Physics.

ELECTRON VACANCY PRODUCTION IN NEAR-SYMMETRIC COLLISIONS OF 100 MeV COPPER IONS

H. J. Hay, L. F. Pender, and P. B. Treacy Mar. 1981 14 p refs Submitted for publication
(ANU-P-771) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Using a high-resolution Si(Li) X-ray detector, characteristic K X-rays have with targets of Cr, Fe, Cu, Ge and Se bombarded by 100 MeV Cu ions, equilibrated by passing through carbon. Cross sections for X-ray production, target-to-projectile vacancy-sharing ratios and Ksub(-) to Ksub (ALPHA) ratios, were measured and compared to predictions of molecular-coupling theories. The results show little agreement with existing models based on rotational coupling in molecular-orbital states. DOE

N82-19019# Rice Univ., Houston, Tex.
ELECTRON-SPIN-POLARIZATION EFFECTS IN LOW ENERGY ELECTRON DIFFRACTION, ION NEUTRALIZATION AND METASTABLE ATOM DEEXCITATION AT SOLID SURFACES
G. K. Walters 1981 15 p refs
(Contract DE-AS05-81ER-10817)
(DE82-001179; DOE/ER-10817/1) Avail: NTIS HC A02/MF A01

The development of surface sensitive spectroscopies based on electron spin dependences in electron atom and in surface interactions is discussed. Spin polarization effects in LEED (i.e., PLEED) can be exploited to provide structural information at crystalline surfaces. Nickel (110) has polarization vs. energy profiles that are rich in structure and surprisingly large peak polarizations (approx. 20%). Addition of an ordered tellurium adlayer significantly changes both the PLEED polarization and intensity profiles. Work has begun on construction of a GaAs spin polarized electron source that should provide improved accuracy and data acquisition rates in future PLEED experiments. DOE

N82-19020# North Carolina Univ., Chapel Hill.
RESEARCH ON ATOMIC, MOLECULAR, AND NUCLEAR PHYSICS Progress Report, 1 Dec. 1980 - 30 Nov. 1981
S. M. Shafroth 1981 23 p refs
(Contract DE-AS05-78ER-06027)
(DE82-001175; DOE/ER-06027/13) Avail: NTIS HC A02/MF A01

Experimental progress has involved the study of resonant transfer and excitation (RTE) of electrons from target atoms to highly ionized fast projectiles such as 67 MeV Si(11+), for example, where a resonant transfer is expected to take place. Progress is described on the singles X-ray excitation cross section aspect of this problem. K X-ray production of Si and Ar in collisions with Si (q+) energies ranging from 50 to 88 MeV and charge states 10, 11, 12 was studied. T.M.

N82-19021# Washington Univ., Seattle. Dept. of Physics.
WEAK-INTERACTION EXPERIMENTS AT LOW ENERGIES: RESULTS FROM ATOMIC AND NUCLEAR PHYSICS
E. G. Adelberger 1981 21 p refs
(Contract DE-AC06-76ER-07388)
(DE82-001724; DOE/ER-1388/504) Avail: NTIS HC A02/MF A01

Experimental results in the following areas are reviewed: the parity violating eN force, the parity violating NN force, the (MU) sub e mass, and the electric dipole moment of the neutron. The standard model accounts well for most of the data in atomic and nuclear parity violation. The evidence for a finite neutrino mass suggests that modification to the standard model is required while the neutron electric dipole moment provides a constraint on theories of CP nonconservation. T.M.

N82-19022# Ohio State Univ., Columbus. Dept. of Physics.
CHROMOSTATICS OF TWO-QUARK SYSTEMS
K. A. Milton (Oklahoma State Univ.), William F. Palmer, and Stephen S. Pinsky 1981 22 p refs
(Contract DE-AC02-76ER-01545)
(DE82-001181; DOE/ER-01545/314) Avail: NTIS HC A02/MF A01

An estimate for the mean field potential between two heavy quarks (qq) is studied using chromostatics. To do so, the pseudocolor charge algebra is worked out for the qq system in SU(n) of color. Using the leading logarithm, renormalization, group improved Euclidean action for the gluon fields, it is found the mean field potential depends crucially on the algebraic properties of the sources, and that while the quark antiquark (q anti q) system possesses an at least linear potential, the qq system has infinite energy, and hence is decoupled from the physical spectrum. The physical states exhibit color screening. DOE

N82-19023# Washington Univ., Seattle. Dept. of Physics.
QUARK-GLUON PLASMA AND ULTRA-RELATIVISTIC NUCLEUS-NUCLEUS COLLISIONS
L. McLerran Jun. 1981 28 p refs Presented at the 5th High Energy Heavy Ion Study, Berkeley, Calif., 18-22 May 1981
(Contract DE-AC06-76ER-01388)
(DE81-030321; DOE/ER-01388/860; RLO-1388-860; CONF-8105104-9) Avail: NTIS HC A03/MF A01

A space-time picture of the fragmentation and central regions is presented for extremely high energy head-on heavy nucleus collisions. The energy densities of the matter produced in such collisions are estimated. Speculations concerning the possible formation of a quark-gluon plasma are discussed, as are possible experimental signals for analyzing such a plasma. DOE

N82-19024# Lehigh Univ., Bethlehem, Pa.
ANGULAR SCATTERING AND CHANNELING WIDTHS OF POSITIVE AND NEGATIVE PARTICLES AT MULTI-GeV ENERGIES
M. A. Hasan, A. S. Kanofsky, R. Allen, C. R. Sun (State Univ. of New York, Albany), W. M. Gibson (State Univ. of New York, Albany), I. J. Kim (State Univ. of New York, Albany), G. C. Williams (State Univ. of New York, Albany), R. A. Carrigan, Jr. (Fermi National Accelerator Lab.), B. L. Chrisman (Fermi National Accelerator Lab.), and T. E. Toohig (Fermi National Accelerator Lab.) 1981 55 p refs
(Contract DE-AS02-76ER-02894)
(DE82-002933; DOE/ER-02894/1) Avail: NTIS HC A04/MF A01

An experiment on the channeling of high energy particles (protons, pions, and kaons) through a 2 cm thick germanium crystal is described. Experimental results are presented on the multiple scattering of particles passing in a random direction through a crystal and channeling widths for positive and negative heavy particles. Results are also presented on multiple scattering of channeled high energy particles of 35, 100, and 250 GeV energy through the crystal, compared with multiple scattering of particles passing in a random direction through the crystal. DOE

N82-19025# Massachusetts Inst. of Tech., Cambridge. Neutron Diffraction Lab.
LOW TEMPERATURE AND NEUTRON PHYSICS STUDIES Progress Report, Jun. 1980 - Jul. 1981
Jul. 1981 7 p refs
(Contract DE-AS02-76ER-03342)
(DE82-001573; DOE/ER-03342/9; MIT-3342-9) Avail: NTIS HC A02/MF A01

Experimental research work with the neutron diffraction spectrometers on neutron interferometry and on interferometer applications to fundamental neutron physics is reported. Technical improvements in the interferometer system are described. Preliminary experiments in which the phase difference between two coherent beams caused by interferometer angular motion are reported and theoretical work leading to the interpretation of these motion studies is noted. Calibration studies relating intensity effects to phase gradients introduced into the interferometer, performed with a continuously-variable prism assembly, indicate the presence of anomalous phase effects whose origin is being explored. An Aharonov-Bohm experiment with neutrons is reported in which the coupling between a neutron and the magnetic vector potential is considered. Single and double slit diffraction patterns with neutrons are described. DOE

N82-19026# Minnesota Univ., Minneapolis.
NEAR NEIGHBOR SEPARATIONS OF SURFACE ATOMS Progress Report
1981 18 p refs
(Contract DE-AC02-80ER-10583)
(DE82-002166; DOE/ER-10583/2) Avail: NTIS HC A02/MF A01

The construction phase of the work to develop a technique to measure near neighbor distances of low Z atoms that are adsorbed at solid surfaces is nearly complete. The instrument

can measure EXAFS-like secondary yield of high energy electrons. The goal is to then combine the knowledge of these spacings with analysis of electron diffraction data to determine the structure of surfaces. The apparatus that was constructed is described. It became apparent in the course of this work that the instrument would also be well suited for reflection high energy electron diffraction (RHEED), and therefore the applicability of RHEED to studies of surface structure was investigated. Exploratory measurements were made on an existing RHEED system that was available. The conclusion is that RHEED is ideally suited to study the distribution of steps on surfaces. DOE

N82-19027# Science Research Council, Chilton (England).
NEUTRON TRANSPORT FROM TARGETS TO MODERATORS
A. D. Taylor 1981 36 p Presented at a Meeting on Targets for Neutron Beam Spallation Sources, KFA, Juelich, West Germany, 11-12 Jun. 1979
(PB82-106915; RL-81-057) Avail: NTIS HC 03/MF A01 CSCL 20G

The following topics are discussed: boundary conditions for the SNS; the MUSTA experiment; softening of the target spectrum; reflector size; spectral tailoring; spatial distribution, time structure; angular distribution; and target-moderator configuration. GRA

N82-18242*# Centre National d'Etudes des Telecommunications, Bagneux (France).
PHENOMENA INDUCED BY CHARGED PARTICLE BEAMS
C. Beghin *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 20H

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-19028*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYTIC OPTICAL POTENTIALS FOR NUCLEON-NUCLEUS NUCLEUS-NUCLEUS COLLISIONS INVOLVING LIGHT AND MEDIUM NUCLEI
Hari B. Bidasaria and Lawrence W. Townsend (Old Dominion Univ.) Jan. 1982 25 p refs
(NASA-TM-83224) Avail: NTIS HC A02/MF A01 CSCL 20H

Utilizing an optical model potential approximation to the exact nucleus-nucleus multiple-scattering series, optical potentials for nucleon-nucleus and nucleus-nucleus collisions are analytically derived. These expressions are applicable to light and medium cosmic ray nuclei as their single-particle density distributions are analytically determined, without approximation, from their actual harmonic well charge density distributions. Pauli correlation effects are included through the use of a simple Gaussian function to replace the usual expression obtained in the infinite nuclear matter approximation. Author

74 OPTICS

Includes light phenomena.

N82-19029* National Aeronautics and Space Administration. Pasadena Office, Calif.
FIBER OPTIC TRANSMISSION LINE STABILIZATION APPARATUS AND METHOD Patent
George F. Lutes, Jr. (JPL, California Inst. of Technology, Pasadena) and Kam Y. Lau, inventors (to NASA) (JPL, California Inst. of Technology, Pasadena) Issued 1 Sep. 1981 16 p Filed 17 Sep. 1980 Supersedes N80-34250 (18 - 24, p 3352) Sponsored by NASA
(NASA-Case-NPO-15036-1; US-Patent-4,287,606; US-Patent-Appl-SN-188160; US-Patent-Class-455-617; US-Patent-Class-455-610; US-Patent-Class-455-615; US-Patent-Class-455-612) Avail: US Patent and Trademark Office CSCL 20F

A reference signal of RF frequency modulates a 0.85 micrometer wavelength optical transmitter. The output of which passes through a first optical filter and a voltage-controller phase shifter. The output of the phase shifter is provided to the fiber optic transmission line. At the receiving end of the transmission line, the signal is demodulated and used to modulate a 1.06 micrometer optical transmitter. The signal from the transmitter is provided to the fiber optic transmission line and passes through the voltage-controlled phase shifter to a phase error detector. The phase of the modulation of the 1.06 micrometer wavelength signal is compared to the phase of the reference signal by the phase error detector. A phase control signal related to the phase difference is provided to the voltage controlled phase shifter which alters the phase of both optical signals until a predetermined phase relationship between modulation on the 1.06 micrometer signal and the reference signal is obtained.
Official Gazette of the U.S. Patent and Trademark Office

N82-19030*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HEAT REFLECTING FIELD STOP Patent Application
Wayne A. Massey (TRW Defense and Space Systems Group, Redondo Beach, Calif.) and Dale L. Massey, Inventors (to NASA) (TRW Defense and Space Systems Group, Redondo Beach, Calif.) Filed 30 Oct. 1981 10 p Sponsored by NASA
(NASA-Case-LAR-12443-1; US-Patent-Appl-SN-315582) Avail: NTIS HC A02/MF A01 CSCL 20F

An apertured field stop with a highly reflective surface is described which reflects unwanted rays outside the instrument in order to minimize internal heating. When the reflective field stop is spherically shaped with a radius of curvature equal to the effective focal length of the host optical instrument, rejected rays are reflected back through the light gathering entrance of the instruments. The heat associated with these rejected rays dissipates outside the instrument in the space surrounding entrance orifice. The reflective field stop proves to be a highly effective device for minimizing the internal heat within optical instruments such as space telescopes used to image the Sun and Earth. This invention can be applied to any small field of view optical system that uses a high intensity source radiation as an input. NASA

N82-19031# Harris Corp., Melbourne, Fla. Government Communication Systems Div.
FIBER OPTIC DATA BUS FOR THE AN/GYQ-21(V) Final Technical Report, 23 Jul. 1979 - 23 Oct. 1980
R. E. Dragoo and D. B. Kemsey Griffiss AFB, N.Y. RADC Jun. 1981 261 p
(Contract F30602-79-C-0218; AF Proj. 4519)
(AD-A108394; RADC-TR-81-153) Avail: NTIS HC A12/MF A01 CSCL 17/2

This report describes the application of fiber optic bus technology to the AN/GYQ-21(V) system with the goal of providing for increased separation distances between peripherals and increased long distance data transfer rates. The ring network and the transmissive star network are described as implementable fiber optic busses which can provide for the following enhancements to the 21(V) system: increased separation distances up to 1 kilometer between peripherals and increased long distance data transfer rates up to 60 Mbps. GRA

N82-19032# State Univ. of New York at Albany. Space Astronomy Lab.
EXPERIMENTAL RESULTS OF MULTIPLE SCATTERING Final Report, Mar. 1979 - Jul. 1980
Donald W. Schuerman and Ru. T. Wang Aberdeen Proving Ground Md. Army Armament Research and Development Command Nov. 1981 53 p refs
(Contract DAAG29-79-C-0055)
(AD-A108291; ARCSL-CR-81003) Avail: NTIS HC A04/MF A01 CSCL 20/6

Microwave analog measurements of scattering by ensembles of 2n(n = 1,2,3) interacting spheres are presented. Emphasis is placed on the amplitude and phase measurements of the forward scattered wave as a function of the mutual separation of the spheres and the orientation of the ensembles with respect to the incident beam. A few side scattering and angular distribution measurements indicate the existence of specular scattering at particular array orientations for some of the two-sphere ensembles. A short historical sketch, a description of the experiments, and phenomenological explanations of the results are also given.
GRA

N82-19033# Naval Surface Weapons Center, White Oak, Md.
NITINOL INTERCONNECT DEVICE FOR OPTICAL FIBER WAVEGUIDES Final Report
David Goldstein and John Tydings 1 Jul. 1981 71 p refs
(AD-A108278; NSWC/TR-81-129; NAVSEA-S562-78) Avail: NTIS HC A04/MF A01 CSCL 20/6

Two different interconnect devices for optical fibers have been developed. Each uses the shape memory effect alloy 'NITINOL'. The simpler of the two is of tubular design and accommodates fibers as small as 200 micron diameter. The more complex multi-component design accommodates 125 micron diameter fibers. The complex design is simpler to use, easier to manufacture and lower in cost. It permits less than 1 db loss and is re-matable. A description of NITINOL manufacture is given.
Author (GRA)

N82-19034# Istituto di Ricerca e Tecnologia per lo Studio del Plasma Nello Spazio, Frascati (Italy).
THE TIRGO SECONDARY MIRROR MODULATION SYSTEM [SISTEMA DI MODULAZIONE DELLO SPECCHIO SECONDARIO DEL T.I.R.G.O.]
P. Baldetti, F. Bordoni, A. DiGiammarco, and P. Saraceno May 1981 40 p refs In ITALIAN
(IPS-81-8) Avail: NTIS HC A03/MF A01

The modulation system for the secondary mirror of the infrared telescope TIRGO is described. The optimal modulation frequency, the waveforms, absolute and differential modulation, and the mechanical characteristics of the modulator are considered. The mechanics of the actuator, of mounting the mirror, and the optical alignment of the mirror are discussed. The electronics of the system are described, specifically the generator, command electronics, power amplifiers, position sensors, and the protective electronics. The procedure for regulating the position sensors is presented.
Transl. by J.D.H.

N82-18235*# Michigan Univ., Ann Arbor.
AN IMAGING SPECTROMETRIC OBSERVATORY
M. R. Torr *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 4 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-19035 Texas Univ. at Arlington.
THEORETICAL ASPECTS OF THE NONLINEAR INTERACTION OF DRIFT-TYPE INSTABILITIES IN A PLASMA Ph.D. Thesis
Paul Willis Terry 1981 180 p
Avail: Univ. Microfilms Order No. 8128698

Various theoretical aspects of plasma turbulence are explored in the context of low frequency drift-type instabilities in toroidally confined plasmas. Of central importance is consideration of the random phase approximation-its role and validity in plasma turbulence theories. Linear theory is first considered to find the criteria for marginal stability of the toroidal ion temperature gradient drift mode. Analytical criteria for the onset of instability giving the dependence on wavenumber, magnetic curvature, and temperature gradient are derived from the drift kinetic equation with the grad-B and curvature drift resonances retained. Three examples of nonlinear theory relevant to drift wave turbulence are then developed to introduce important nonlinear mechanisms and to illustrate the role of the random phase approximation. The question of the validity of the random phase approximation is then addressed by considering the interaction of three electron drift waves. The equations for the exact interaction are derived their properties are examined, and sample numerical solutions are presented.
Dissert. Abstr.

N82-19036# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE SELF-CONSISTENT SOLUTIONS OF PULSAR PLASMA WAVES
Abraham C.-L. Chian Jan. 1982 17 p refs Submitted for publication
(INPE-2302-PRE/071) Avail: NTIS HC A02/MF A01

In the theoretical study of strong pulsar electromagnetic waves in an electron-ion plasma a dynamic parameter relating electron and ion velocities necessarily appears. It is shown that the dynamic parameter is a function of the plasma stream velocity, the wave velocity, the wave amplitude and the electron-ion mass ratio. In order to obtain self-consistency in the solutions, the dynamic parameter must be chosen appropriately when other parameters are specified.
Author

N82-19037# Office of Naval Research, London (England).
THE 4TH INTERNATIONAL TOPICAL CONFERENCE ON HIGH-POWER ELECTRON AND ION-BEAM RESEARCH AND TECHNOLOGY
John R. Neighbours 9 Oct. 1981 16 p Conf. Held at Palaiseau, France, 29 Jun. - 3 Jul. 1981
(AD-A108353; ONRL-C-6-81) Avail: NTIS HC A02/MF A01 CSCL 20/7

The Fourth International Topical Conference on High-Power Electron and Ion-Beam Research and Technology program included electron and ion beam generators, beam transport plasma heating and free electron lasers. This report is principally about foreign research results. It also contains a list of speakers and the topics discussed.
GRA

N82-19038# Air Force Geophysics Lab., Hanscom AFB, Mass.
PRINCIPLES AND APPLICATIONS OF RADIO FREQUENCY IMPEDANCE PROBES Interim Scientific Report
S. T. Lai 27 Jul. 1981 24 p refs
(AF Proj. 7661)
(AD-A108677; AFGL-TR-81-0217; AFGL-ERP-749) Avail: NTIS HC A02/MF A01 CSCL 20/9

The underlying principle of the radio frequency plasma probe is presented. The resonance properties of the probe's equivalent circuit with and without external magnetic field are analyzed. The admittance of the equivalent circuit is shown to possess a pole at the sheath hybrid frequency and a zero at the upper hybrid frequency. The phase of the admittance changes signature to become negative in the range of frequency between the pole and the zero. Some significant experiments using radio frequency plasma probe for ionospheric research are briefly described. GRA

N82-19039# Naval Research Lab., Washington, D. C. Geophysical and Physics Dynamics Branch.
PHYSICAL MECHANISM OF WAVE-PARTICLE RESONANCES IN A CURVED MAGNETIC FIELD
J. D. Huba and J. F. Drake (Science Applications, Inc.) 27 Nov. 1981 24 p refs
(RR0330244)
(AD-A108360; NRL-MR-4668) Avail: NTIS HC A02/MF A01 CSCL 20/9

The physical mechanism of wave-particle resonances in a curved magnetic field is investigated. Specifically, the energy exchange process between a wave and resonant curvature drifting particles is discussed. A general expression for the wave damping/growth rate is derived based upon physical arguments. The theory is applied to the lower-hybrid-drift instability and nonlinear consequences are discussed.
GRA

N82-19040# Fom-Instituut voor Plasmafysica, Rijnhuizen (Netherlands).
EQUILIBRIUM STUDIES OF SKIN LIKE PRESSURE AND CURRENT-DENSITY PROFILES

A. W. Kolfschoten Sep. 1981 54 p refs Sponsored by EURATOM and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-81-134) Avail: NTIS HC A04/MF A01

The MHD equilibria which produce hollow pressure and current profiles that evolve into normal Tokamak parabolic profiles following heating pulses were investigated. A computer code for toroidal ideal MHD equilibria, using a Moebius transformation, which maps the plane of the cross section onto a plane in which the magnetic axis coincides with the origin for the coordinate system was applied. The profiles obtained show good agreement with the experimentally measured ones. Hollow profiles enable the plasma to be in an equilibrium state for which the displacement of the magnetic axis in the direction of the inner side of the torus, i.e., a negative displacement. The average toroidal beta values of these plasmas, subject to the restriction that the safety factor q is > 1 everywhere, can be as high as 10%.
Author (ESA)

N82-19041# Fom-Instituut voor Plasmafysica, Rijnhuizen (Netherlands).
THE INFLUENCE OF IMPURITIES ON THE DISCHARGE BEHAVIOR IN SPICA Thesis - Utrecht State Univ.
A. F. G. vanderMeer Oct. 1981 70 p refs Sponsored by EURATOM and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-81-135) Avail: NTIS HC A04/MF A01

The effect of oxygen and silicon on plasma decay in a screw pinch device is discussed. Plasma current, current displacement, impurity radiation, electron line density, impurity concentrations, and power flux to the wall were measured by optical and magnetic instruments. A snow plow model which incorporates bias field is used to describe the implosion which causes heating. Heating is followed by adiabatic compression. Impurity effect numerical simulation is described. Computer simulation and absolute intensity measurements show oxygen content < 0.1% in standard discharges. With 1% oxygen added, content is > 0.3%. The 0.1% value is a factor of 3 above value from background pressure, indicating that most of the oxygen content is due to plasma-wall interaction, probably during the ringing predischarge. Silicon concentration is < half this value. Author (ESA)

N82-19042# Fom-Instituut voor Plasmafysica, Rijnhuizen (Netherlands).
TIME OF FLIGHT ANALYSIS OF CHARGE EXCHANGE NEUTRAL PARTICLES FROM THE TORTUR 2 PLASMA Thesis - Utrecht State Univ.
H. J. B. M. Brocken Oct. 1981 23 p refs Sponsored by EURATOM and Nederlandse Organisatie voor Zuiver-Wetenschappelisk Organisatie (ZWO)
(Rept-81-136) Avail: NTIS HC A02/MF A01

A disk chopper for time of flight analysis of fast neutrons was constructed in order to determine ion energy spectra at lower energies than can be obtained by conventional electromagnetic analyzers. The detection system is described and the measurements are analyzed. The influence of reflections of neutrals at the liner wall was important in calculations of the neutral density profile at the plasma edge. The neutral energy spectrum in the lower energy range was strongly enhanced by this effect. High energy ranges were unaffected by reflection effects. Asymptotic slopes can be used for central ion temperature determination. Author (ESA)

N82-19043# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
[ACTIVITIES REPORT OF THE INSTITUTE FOR PLASMA RESEARCH] Annual Report, 1980 [FORSCHUNGSBERICHT 1980]
1980 18 p refs In GERMAN
Avail: NTIS HC A02/MF A01

Activities in fusion research are reviewed. Radio frequency heating of inhomogeneous plasmas, in particular by means of Alfven and whistler waves, was studied theoretically and experimentally. Equilibrium studies of a toroidal theta pinch were extended to low density operation and shock wave heating experiments were performed. Several plasma diagnostic instruments, using both coherent and incoherent scattering of laser beams, were developed and tested at fusion test facilities. Detailed measurements on neutron and fast ion production in a plasma focus device are reported. The spatial and temporal distribution of such emissions allows for the identification of the relevant physical processes. Author (ESA)

N82-18282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Structures and Dynamics Div.
VIBRATION AND BUCKLING STUDIES OF PRETENSIONED STRUCTURES
W. Keith Belvin *In its* Large Space Systems Technol., 1981 Mar. 1982 p 109-121 (For primary document see N82-18275 09-15)
Avail: NTIS HC A19/MF A01 CSCL 22B

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N82-19044# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRON HOPPING ENERGY INFLUENCE ON THE SPECIFIC HEAT AND CONDUCTIVITY OF PHOSPHORUS DOPED SILICON
M. Fabbri, I. C. daCunha Lima, and A. Ferreira daSilva Jan. 1982 23 p refs Submitted for publication
(INPE-2301-PRE/070) Avail: NTIS HC A02/MF A01

The electronic specific heat and the dc conductivity of the uncompensated Si:P are calculated via a previously developed theory for impurity band in semiconductors. The theory is investigated further in order to take into account the effect of correlation, as well as overlap on the electron hopping energy integral via Heitler-London two-particle wave functions. The calculated specific heat and conductivity show rough agreement when compared to the experimental data over a wide range of donor impurity concentration. The comparison with AMO-MT calculation shows a large enhancement due to a stronger electron correlation. The results of the highly-correlated-electron-gas model and inhomogeneity model are shown for comparison. Author

N82-19045 Case Western Reserve Univ., Cleveland, Ohio.
PLASMON EXCITATION IN ALKALINE EARTH METALS Ph.D. Thesis
Isay Krainsky 1981 160 p refs
Avail: Univ. Microfilms Order No. 8200358

Characteristic energy losses (CEL) of electrons with energies from 1 to 500 eV were studied for alkaline earth metals. All materials studied were deposited just before taking measurements in ultrahigh vacuum. To suppress the background created by true secondary electrons three modes of retarding voltage modulation were utilized. Amplitude halfwidth, and intensity of CEL peaks, corresponding to the surface plasmon (SP) excitation were studied as a function of incident angle and primary energy. It was shown that these results can be partially explained using a two model of a surface CEL peak formation (SP excitation before or after the elastic scattering) or the model of direct electron plasmon scattering. Dissert. Abstr.

N82-19046 Pennsylvania State Univ., University Park.
A THEORETICAL STUDY OF PHOTO-FIELD EMISSION FROM A METAL SURFACE Ph.D. Thesis
Satinder Singh Sidhu 1981 101 p
Avail: Univ. Microfilms Order No. 8129214

Theoretical models are developed for the current field-emitted from a metal surface into vacuum when the surface is simultaneously irradiated with light of wavelength longer than the threshold wavelength for ordinary photoemission. The total photo-field current from a single emitter face exhibits two components - one increasingly montonically with field and the other having an oscillatory dependence on it. Different aspects of photo-field emission experiments are analyzed to identify the results of interest, and the effect of the incident photon flux on the temperature of the emitter is assessed. Several approaches to the theoretical study of photo-field emission are examined

and it is shown that adaptations of the theory of field emission and of the scattering theory treatment of photoemission give equivalent results if photon absorption probability is assumed to be independent of the initial electron state. Dissert. Abstr.

N82-19047 Colorado State Univ., Fort Collins.
COMPARISON OF TWO-PARTICLE CLUSTER EXPANSIONS FOR b.c.c. SPIN OF 1/2 SYSTEMS Ph.D. Thesis
Richard Joseph Krantz 1981 86 p
Avail: Univ. Microfilms Order No. 8126438

The two particle cluster expansion of the Heisenberg Hamiltonian is reviewed applied to a spin 1/2 lattice. All the standard approximations for ferromagnetism, anti-ferromagnetism of the first kind (AF-11), and anti-ferromagnetism of the second kind (AF-2) are reviewed and shown to have a common basis. A set of approximations which may be applied to systems in which the next near neighbor correlations are the dominant interactions is developed. The free energies and second order zero field transition temperatures for the magnetic phases of interest are derived. This set of approximations is then used to describe the free energy and zero field ordering temperature for the recently proposed uudd phase for b.c.c. He.-3. The possibility of first order transitions between the phases consistent with the high temperature susceptibility is discussed for each approximation. A prescription for adding four-particle exchange to these models is discussed. Dissert. Abstr.

N82-19048 Louisiana State Univ. and A&M Coll., Baton Rouge.
ELECTRON-PHONON SCATTERING RATES IN ANTIMONY: RADIO-FREQUENCY SIZE EFFECT Ph.D. Thesis
Thomas Clifton OHara 1981 76 p
Avail: Univ. Microfilms Order No. 8126971

Temperature dependent radio-frequency size effect measurements were performed on high-purity, single crystal antimony plates at thicknesses of 0.592 mm, 0.347 mm, and 0.238 mm. The natural logs of the amplitudes of the data were found experimentally proportional to T(2) in agreement with previous measurements. However, the data were analyzed according to a model in which the electron-phonon scattering frequencies were proportional to T(3) with the explanation that the T(2) behavior is due to the small pieces of Fermi surface in antimony. The electron-phonon scattering frequencies were determined for both holes and electrons and were found to be highly anisotropic in each case. Copies of the computer programs used in the data analysis are included in Appendix I. Author

N82-19049 State Univ. of New York at Stony Brook.
ZERO SOUND ATTENUATION FROM ORDER PARAMETER FLUCTUATIONS IN LIQUID He-3 Ph.D. Thesis
Vijay Kumar Samalam 1981 138 p
Avail: Univ. Microfilms Order No. 8127112

A microscopic theory to explain the excess attenuation observed was constructed. In this model it is assumed that the fluctuations are few in number and well separated so that they do not interact with each other. The effect of fluctuations on the single particle Green's function was calculated. The density of states changes in the presence of fluctuations in a way that foreshadows the superfluid transition. The language of many body perturbation theory was used to construct a transport like equation that is potentially capable of describing high frequency effects. It is shown that to calculate the fluctuations effects consistently, one must include the effect of fluctuations in the equilibrium functions. Dissert. Abstr.

N82-19050 Louisiana State Univ. and A&M Coll., Baton Rouge.
INHOMOGENEOUS RELATIVISTIC ELECTRON SYSTEMS: A DENSITY FUNCTIONAL FORMALISM Ph.D. Thesis
Munagala Venkata Ramana 1981 144 p
Avail: Univ. Microfilms Order No. 8126974

The correlation energy of an unpolarized relativistic electron gas is numerically calculated by summing ring diagrams due to both the longitudinal and transverse photon contributions. From this a local relativistic correlation potential is deduced which appears in the density functional theory of inhomogeneous systems where relativistic effects make important contributions. The non-relativistic gas results are found to be significant underestimates. A fitted form of the correlation energy and potential were used in a self-consistent calculation of energies of atoms of large Z. Trends of the correlation contribution across the periodic table are evaluated. The role of the Breit interaction in a local approximation is evaluated through self-consistent atomic calculations. It is found that the full transverse interaction is underestimated by about an atomic unit in the systems investigated. The problem of the relativistic spin polarized electron gas is considered. The Green function is deduced and used to calculate the particle density, magnetization, exchange energy and potentials. Dissert. Abstr.

N82-19051 Pennsylvania Univ., Philadelphia.
SOLITONS IN ONE-DIMENSIONAL CHARGE DENSITY WAVE SYSTEMS Ph.D. Thesis
Wu-pei Su 1981 213 p
Avail: Univ. Microfilms Order No. 8127079

Theoretical research on one dimensional charge density wave systems is outlined. A simple coupled electron-photon Hamiltonian is studied including a Green's function approach, molecular dynamics, and Monte Carlo path integral method. As in superconductivity, the nonperturbative nature of the system makes the physical ground states and low energy excitations drastically different from the bare electrons and phonons. Solitons carry quantum numbers which are entirely different from those of the bare electrons and holes. The fractional charge character of the solitons is an example of this fact. Solitons are conveniently generated by doping material with donors or acceptors or by photon absorption. Most predictions of the theory are in qualitative agreement with experiments. The one dimensional charge density wave system has potential technological importance and a possible role in uncovering phenomena which might have implications in relativistic field theory and elementary particle physics. M.D.K.

N82-19052 Illinois Univ. at Urbana-Champaign.
ON A PROPOSAL FOR A CONTINUUM WITH MICROSTRUCTURE Ph.D. Thesis
Douglas John Bammann 1981 71 p
Avail: Univ. Microfilms Order No. 8127546

A model for a continuum with microstructure is further substantiated by identifying the microstructure with dislocations. The continuum is viewed as a superimposed state made up from a perfect lattice state, an immobile dislocation state, and a mobile dislocation state. It is assumed that each state evolves continuously in space-time and transitions from one state to another take place spontaneously according to the balance laws of effective mass and momentum. When plastic strain and yield are identified in terms of the parameters characterizing the dislocation states, familiar flow rules and yield surfaces are produced. The capability of the model to predict not only Tresca and Von-Mises plastic behavior but also phenomena such as Prager's kinematic hardening, different responses in tension and compression, latent hardening, and the Bauschinger effect, is shown. The appropriateness of the equations to model creep, cyclic plasticity, and fatigue, is illustrated. Author

N82-19053# Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Technical Physics.
POSITRON STUDIES OF POINT DEFECT INTERACTIONS IN METALS Ph.D. Thesis
Asko Vehanen 1981 9 p refs
(SF-02150) Avail: NTIS HC A02/MF A01

The clarification of elementary properties of atomic defects in metals is discussed, with an emphasis on the nature of interactions between various imperfections, especially, in relation to the mechanical behavior of materials. Trapping behavior into extended defects is presented both theoretically and experimentally. A model quantitatively accounts for the observed temperature dependent positron trapping. Very weak, hardly observable trapping is demonstrated and an experimental description of positron detrapping from monovacancies is presented. A strong impurity from vacancy interaction in nickel, where the void growth is nucleated by substitional antimony is shown. S.L.

N82-19054# Technische Hogeschool, Delft (Netherlands).
RADIATION DETECTION WITH POINT-CONTACT JOSEPHSON JUNCTIONS Ph.D. Thesis
Tim Poorter 12 Nov. 1981 89 p refs
Avail: NTIS HC A05/MF A01

The first step toward producing a suitable heterodyne detector, based on a Josephson junction and incorporated in a complete 230 GHz receiver, was taken by placing a point contact Josephson junction in a 0.65 by 1.35 sq mm rectangular waveguide to operate it as a wideband receiver. From the spectral analysis of this response it was found that optimum coupling of radiation always took place from 170 to 200 GHz. To improve the radiation coupling at 230 GHz the waveguide system was scaled geometrically, resulting in a 0.56 by 1.06 mm waveguide. A Josephson mixer constructed with a very thin Niobium whisker as one of the electrodes, measurement indicated, can show a very low mixer noise temperature and a good conversion efficiency at a frequency as high as 200 GHz. N.W.

N82-19055# Technische Hogeschool, Delft (Netherlands).
THE INFLUENCE OF THE SPIN-ROTOR COUPLING OF METHYL GROUPS IN SOLIDS ON THEIR NMR RELAXATION Ph.D. Thesis
Dirk Jacob Ligthelm 24 Sep. 1982 235 p refs
(ISBN-90-6231-090-7) Avail: NTIS HC A11/MF A01

The NMR spin-lattice relaxation due to the hindered rotations of methyl groups around their three-fold axes in solids was studied. The effects of the rotor-phonon interaction on the motions of the groups were studied. There are processes occurring with an average frequency which cause the motions of a methyl group from one potential well to another. The activation energy decreases for decreasing temperatures while the correlation time at infinite temperatures increases. Processes occurring at higher frequencies are responsible for the occurrence of the effective tunnelling splitting which at low temperatures equals the change in free energy if a methyl group goes from A to E symmetry. Tunnel splitting decreases for increasing temperatures. The Zeeman relaxation rate for a powdered sample is discussed. The NMR technique used is described as well as a flow cryostat with which sample temperature can be varied between 5 K and 300 K. The sample can be rotated with a maximal spinning requency of about 100 Hz. The existence of a tunnelling-assisted maxima is demonstrated. A.R.H.

N82-19056# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRON AND IMPURITY CORRELATIONS IN DOPED SEMICONDUCTORS
R. Kishore, I. C. daCunhaLima, M. Fabbri, and A. Ferreira daSilva Jan. 1982 17 p refs Submitted for publication
(INPE-2309-PRE/074) Avail: NTIS HC A02/MF A01

The theory for the specific heat of doped semiconductors, described by the Hubbard model with random transfer integral, is studied in the presence of a magnetic field and impurity correlations, incorporated through a hard core pair correlations function. The low temperature specific heat and the zero temperature susceptibility of uncompensated phosphorus doped silicon are calculated as a function of impurity concentration. Both electron and impurity correlations enhance the susceptibility and deenhance the specific heat. The behavior of the relative change in the specific heat due to the magnetic field agrees qualitatively with the low temperatures experimental results. S.L.

N82-19057# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DIAGONAL AND OFF-DIAGONAL DISORDER IN DOPED SEMICONDUCTORS
I. C. daCunhaLima, M. Fabbri, and A. Ferreira daSilva Dec. 1981 13 p refs Submitted for publication
(INPE-2292-PRE/067) Avail: NTIS HC A02/MF A01

The specific heat and resistivity of phosphorus doped silicon (Si:P) are calculated taking into account both diagonal and off-diagonal disorder. The randomness in V sub ii decreases both the specific heat and conductivity at low intermediate concentrations. Author

N82-19058# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TWO DIMENSIONAL SUB-BANDS IN ION IMPLANTATION [SUB-BANDAS BIDIMENSIONAIS EM IMPLANTACOES RASAS]
E. Granato Jun. 1981 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBRC, Salvador, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2147-RPE/369) Avail: NTIS HC A02/MF A01

Confinement near the surface, produced by shallow ion implantation on opposite type substrates, can lead to the formation of two dimensional subbands in a way similar to what occurs in the inversion layers of MOS devices, and can give rise to a substantial separation of the minima of those subbands. The motion of carriers perpendicular to the surface is quantized by the space charge potential. Approximate analytical solutions for the values of subbands minima are presented assuming a simplified model for the electronic potential. Results for Si implanted with phosphorus are presented. Author

N82-19059# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PHOTOVOLTAIC DETECTORS FOR INFRARED OPERATION [DETETOR FOTOVOLTAICO CRESCIMENTO DE CRISTAIS JUNCAO P-N]
Chen Ying An and I. N. Bandeira Jun. 1981 7 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2146-RPE/368) Avail: NTIS HC A02/MF A01

Lead oxide semiconductors are discussed. They have a composition dependent energy gap which makes them, besides other optical and electrical characteristics, excellent candidates for tuned infrared detection. The results obtained for detectors of Pb(1-x)Sn(x)Te for the 12 micron range are presented. Author

N82-19060# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRICAL RESISTIVITY OF P IONS IMPLANTED ON Si [RESISTIVIDADE ELETRICA DE IMPLANTACOES RASAS DE P NO SI]
E. Granato, R. Ranvaud, A. Ferreira daSilva, and I. C. daCunha Lima Jun. 1981 10 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2145-RPE/367) Avail: NTIS HC A02/MF A01

A thin layer (nearly 200 A) was produced using low energy implantation of P in Si which, due to the potential barrier of the junction formed, do not allow electrons to escape in the perpendicular direction of the surface. The impurity concentration of this layer was varied using different implantation doses. The resistivity was measured as a function of temperature and concentration in the quasi-two dimensional system so formed in an effort to give evidences on the change of the relative importance of the electric conduction mechanism, connected to the free carriers and impurities. Author

N82-19061# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRONIC STATES OF A NEGATIVE* ION DONOR IN SEMICONDUCTORS [ESTADOS ELETRONICOS DE UM ION DOADOR NEGATIVO EM SEMICONDUTORES]
A. Ferreira daSilva Jun. 1981 4 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2092-RPE/322) Avail: NTIS HC A02/MF A01

The possibility of the existence of a negative donor ion D(-) in semiconductors in which a donor atom captures one electron like a hydrogen negative ion, was suggested in 1958 by Fritzsche and Lampert. There is a great deal of interest in the D(-) center in various semiconductors such as silicon and germanium. According to Fritzsche, the intermediate concentration range of impurities is characterized by the electrical conductivity with an activation energy in a certain temperature region. A D(-) band (in addition to a lower band D) was considered as the most probable origin for the activation energy. However, few experimental results for clarifying the existence of the D(-) band are reported. The H(-) and 1 sigma sub u (H+H yields H(-) + H(+)) states were investigated and compared with the other calculations. Author

N82-19062# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EFFECTS OF ELECTRON TRANSFERENCE ENERGY IN

SEMICONDUCTORS [EFEITOS DA ENERGIA DE TRANSFERENCIA DE ELETRONS EM SEMICONDUTORES]
M. Fabbri, A. Ferreira daSilva, I. C. daCunha Lima, and R. Kishore Jun. 1981 11 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2129-RPE/353) Avail: NTIS HC A02/MF A01

The behavior of impurity in semiconductors is investigated via the electron transfer energy integral. The resistivity of Ge:Sb is calculated for various types of transfer integral and compared with the experimental results. Neglecting localization effects, the variation of the energy gap Ag between impurity bands is compared with the experimental activation energy e2 of Si:P and Ge:Sb, for different concentrations. A qualitative agreement with the experiment has been found. Author

N82-19063# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRONIC STRUCTURE OF THE D(-) STATE AND EXCITED DONOR STATES OF GRAIN IMPURITIES IN DOPED SEMICONDUCTORS [ESTRUTURA ELETRONICA DO ESTADO D(-) E ESTADOS DOADORE EXCITRONICOS DE IMPUREZAS RASAS EM SEMICONDUTORES DOPADOS]
A. Ferreira daSilva Jun. 1981 8 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2115-RPE/339) Avail: NTIS HC A02/MF A01

The previously developed self consistent effective Hartree-Fock Hamiltonian model with a spin polarized potential is applied in order to get correct value for D(-) state in doped semiconductors at very low impurity concentrations. The experimental value E sub D(-) = 0.0555 R (sub y) below the host conduction band was found. Just below the critical impurity concentration, the exciton states and pairs should modify the Mott-Hubbard-Anderson model, according to recent experiments, replacing the upper Hubbard band for those states. The disordered system as well as correlation effects are carried out by simulation on a computer. Author

N82-19064# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PARAMAGNETIC SUSCEPTIBILITY OF PHOSPHORUS DOPED SILICON [SUSCEPTIBILIDADE PARAMAGNETICA NO SILICO DOPADO COM FOSFORO]
I. C. daCunha Lima, R. Kishore, M. Fabbri, and A. Ferreira daSilva Jun. 1981 9 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981 Submitted for publication
(INPE-2105-RPE/332) Avail: NTIS HC A02/MF A01

A previously developed self-consistent many body theory for disordered systems was applied to calculate the paramagnetic susceptibility of phosphorus doped silicon. The results at 0 K are compared with the experimental results at low temperature and other calculations. A reasonable agreement with the experiment was found concerning the critical concentration of the impurities when the metal non-metal transition occurs. Author

N82-19065# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
CORRELATION IN DOPED SEMICONDUCTORS [CORRELACAO EM SEMICONDUTORES DOPADOS]
Mauricio Fabbri, Antonio Ferreira daSilva, and Ivan Costa daCunha Lima Jun. 1981 12 p refs In PORTUGUESE; ENGLISH summary Presented at the 33rd Ann. Meeting of SBPC, Salvador, Bahia, Brazil, 8-15 Jul. 1981
(INPE-2108-RPE/334) Avail: NTIS HC A02/MF A01

Impurity bands were investigated further in order to show how sensitive the resistivity is in n-type doped semiconductors to changes in electron correlation. The effect of correlation as well as overlap on the electron hopping energy integral are taken into account via Heitler-London two particle wave functions. The magnitude of the electron hopping energy integral is reduced. The electron correlation substantially reduces the bandwidth via the cut off of the long range hopping. The impurity level tends to the ionization energy = - 1.0 as Rij yields infinity. The calculated resistivities for Si:P, Ge:Sb and CdS:In when compared to the experimental data present good agreement around and above the impurity critical concentration for the metal-nonmetal transition. The comparison with AMO-MT calculation shows a big enhancement due to a stronger electron correlation. Author

N82-19066# Helsinki Univ. of Technology, Otaniemi (Finland). Dept. of Technical Physics.
NEUTRON SCATTERING STUDIES OF ATOMIC VIBRATION IN NICKEL AND SOLID DIMETHYLACETYLENE Ph.D. Thesis
Kari Tilli 1982 25 p refs
Avail: NTIS HC A02/MF A01

A diffraction study of the Debye-Waller factor in nickel together with a thorough statistical analysis of the experiments and inelastic neutron scattering investigation of the methyl-group rotation in solid dimethylacetylene is presented. Librational motions in dimethylacetylene, accuracy in neutron time-of-flight diffractometry, correlation in the statistical analysis of a reverse Fourier neutron time-of-flight experiment, and neutron powder diffraction studies of the Debye-Waller factor in nickel are discussed. M.D.K.

N82-19067# United Technologies Research Center, East Hartford, Conn.
INFLUENCE OF CONTACT CONDITIONS AND THE CIRCUIT ON SHORT NEGATIVE DIFFERENTIAL MOBILITY SEMICONDUCTING DEVICES Final Report
H. L. Grubin 3 Aug. 1981 132 p refs
(Contract N00014-78-C-0269)
(AD-A108140) Avail: NTIS HC A07/MF A01 CSCL 20/14

The physics and operation of multi-terminal near- and sub-micron length, hot electron semiconductor devices were investigated. Problems studied include: transient overshoot, bias dependence of overshoot, self-excited oscillations, length dependence of negative differential mobility region, and spatial transients in short channel GaAs devices. T.M.

N82-19068# Varian Associates, Palo Alto, Calif. Solid State Lab.
SUBMICRON FETS USING MOLECULAR BEAM EPITAXY Final Report, Aug. 1977 - Sep. 1981
S. Bandy, Y. Chai, R. Chow, T. Gibbs, C. Hooper, C. Nishimoto, and P. Stonestrom Oct. 1981 53 p refs
(Contract N00014-77-C-0655; RF62581001)
(AD-A108556) Avail: NTIS HC A04/MF A01 CSCL 20/7

Using electron-beam exposure and MBE GaAs, FETs have been fabricated with gate lengths of around 0.25 micron. A noise figure of 1.1 dB with an associated gain of 14 dB has been measured at 8 GHz. A new technique to increase the gate cross-sectional area by employing a mushroom gate profile reduced the gate resistance by about a factor of six, but this dramatic reduction in input resistance resulted in only 0.2-0.3 dB improvement in the measured minimum noise figure. Because of this, it is felt that there is a problem of matching such a high Q input with the rather lossy microstrip technique used, resulting in an inaccurate measurement of the noise figure. Author (GRA)

N82-19069# Vermont Univ., Burlington. Dept. of Chemistry.
THE ELECTRICAL PROPERTIES OF Na3Cu4S4, MIXED-VALENCE ONE-DIMENSIONAL METAL
Zbigniew Peplinski, David B. Brown, Timothy Watt, William E. Hatfield, and Peter Day 1 Dec. 1981 20 p refs Prepared jointly with North Carolina Univ. and Oxford Univ. Submitted for publication
(Contract N00014-76-C-0816; NR Proj. 053-617)
(AD-A108517; TR-23) Avail: NTIS HC A02/MF A01 CSCL 20/3

Four probe electrical conductivity measurements from 15-300K demonstrate that the mixed-valence compound Na3Cu4S4 is metallic. Measurements on single crystals reveal that the conductivity is highly anisotropic, with enhanced conductivity parallel to the crystal needle axis, corresponding to pseudo one-dimensional (Cu4S4(3-)) columns in the structure. For single crystals, resistance increases from 1/15000 ohm cm at 300 K to 1/300,000 ohm cm at 15 K. A small, temperature independent magnetic susceptibility is consistent with metallic

behavior. Diffuse reflectance spectra support the formulation of this compound as a Class III B mixed-valence S(2-)/S(-) solid. GRA

N82-19070# Michigan Univ., Ann Arbor. Electron Physics Lab.
GaAs FET DEVICE MODELING AND PERFORMANCE Interim Report, Feb. 1979 - Feb. 1981
J. R. East and G. I. Haddad Wright-Patterson AFB, Ohio AFWAL Nov. 1981 65 p refs
(Contract F33615-77-C-1132; AF Proj. 2002)
(AD-A108745; TR-152; AFWAL-TR-81-1191) Avail: NTIS HC A04/MF A01 CSCL 09/1

This technical report contains a description of a quasi-two-dimensional model for GaAs FET operation. The model is based on modified expressions for the carrier continuity and Poisson equations in the conducting channel of an FET. The model is compared to full two-dimensional results to determine its accuracy. It is then used to study a variety of operating conditions. The effect of various material and device parameters are also discussed. Author (GRA)

N82-19071# California Univ., Santa Barbara.
OPTICAL INVESTIGATIONS OF THE RECOMBINATION PROCESSES IN LASER-ANNEALED AND THERMALLY-ANNEALED SEMICONDUCTORS Interim Report, 1 Jul. 1979 - 30 Jun. 1980
James L. Merz Griffiss AFB, N.Y. RADC Sep. 1981 43 p refs
(Contract F19628-79-C-0128; AF Proj. 2306)
(AD-A108627; RADC-TR-81-233) Avail: NTIS HC A03/MF A01 CSCL 20/12

Electron-beam-induced current and low temperature photoluminescence have been used as minority-carrier probes to investigate the perfection of beam-annealed silicon. Results for both laser and electron-beam annealing are reported. For CW laser annealing of ion implantation damage, the range of laser power over which good quality annealed material can be achieved is very limited, and strongly dependent on the substrate temperature during the anneal. At relatively high laser power, Laser-induced damage is observed, and misfit dislocations are introduced for laser power just below that required to melt the substrate. Superior results are obtained with the use of a scanning electron beam for annealing: the range of beam power is broader, and the amount of beam overlap for subsequent scans required to achieve good annealing is less for the electron-beam case compared to the case of laser annealing. Both EBIC and photoluminescence results indicate that the laser-induced damage is produced deeper in the substrate than the implanted layers. Estimates of the lattice displacement resulting from strain after laser annealing are made from the details of the photoluminescence spectra; this lattice displacement is found to be small, corresponding to 0.01% of the lattice constant. Author (GRA)

N82-19072# Cornell Univ., Ithaca, N. Y.
MICROWAVE SEMICONDUCTOR RESEARCH: MATERIALS, DEVICES, CIRCUITS Technical Report, 1 Mar. 1977 - 30 Apr. 1981
L. F. Eastman, C. E. Wood, D. W. Woodard, W. Ku, and J. M. Ballantyne Dec. 1981 69 p refs
(Contract F49620-80-C-0069)
(AD-A108399) Avail: NTIS HC A04/MF A01 CSCL 20/12

The growth and characterization of high purity and chromium doped GaAs and Al, GaAs for buffer layers in high performance GaAs FET's was carried out. Deep level transient spectroscopy was used to measure electron traps in Schottky diodes and GaAs FET's. The investigation of microwave field-effect transistor performance limits set by layer composition and contact geometry was carried out. Critical physical electronics parameters for very high voltage operation of GaAs FET's were determined. The electric field distribution and the parasitic output conductance due to buffer layer current were studied and optimized. The use of MBE tailored doping profiles for improved microwave device operation was studied. GaAs/Al, GaAs selectively doped heterojunctions were grown by MBE and studied for potential use in high performance transistors. High electron mobility (80,000 sq cm/v-s) at 77K was first obtained in this effort, following the optimization of the growth conditions of the Al, GaAs. In addition, high resistivity Al, GaAs buffer layers for power FET's were obtained. GRA

N82-19073# Atomic Energy Research Establishment, Harwell (England). Theoretical Physics Div.
A MODEL FOR STORED ENERGY IN AMORPHOUS SILICA
G. Tinivella Dec. 1980 13 p refs
(AERE-TP-877) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The observed saturation value of stored energy in irradiated amorphous silica is too big to be explained by the energy of recombined non-grouped defects. The hypothesis that it can be due to a structural change was tested, and a simple model based on the fluctuation of the atomic distances shows a reasonable agreement with the experimental data. DOE

N82-19074# Tasmania Univ., Hobart (Australia). Dept. of Physics.
TRANSIENT CAPACITANCE MEASUREMENTS OF DEEP LEVEL DEFECTS INTRODUCED IN BETA-RAY COMPENSATED GERMANIUM BY LONG-TERM ANNEALING AT ROOM TEMPERATURE
S. J. Pearton, A. A. Williams, A. J. Tavendale, and E. M. Lawson Sep. 1980 25 p refs Prepared jointly with Australian Atomic Energy Commission, Lucas Heights
(AAEC/E-501; ISBN-0-642-59698-0) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Deep level transient spectroscopy (DLTS) was applied to defect centers in beta-ray compensated germanium that was subjected to long-term annealing at room temperature. Deep donor levels were observed for the first time; annealing 675 C for 3 hours increased their concentration in proportion to the free carrier density, indicating stable defect-impurity complexes. Recently irradiated samples from the original material do not show these levels. DOE

N82-19075# Stanford Univ., Calif. Electronics Lab.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: THE CAPABILITIES AND LIMITATIONS OF AUGER SPUTTER PROFILING FOR STUDIES OF SEMICONDUCTORS Final Report
S. A. Schwarz, C. R. Helms, W. E. Spicer, and N. J. Taylor (Varian Associates, Palo Alto, Calif.) Sep. 1981 58 p refs
(Contract NBS-5-35944; ARPA Order 2397)
(PB82-120122; NBS-SP-400-67; LC-81-600003) Avail: NTIS HC A04/MF A01 CSCL 20L

Materials characterization is a critical area in current silicon integrated circuit technology. Those techniques that are commonly used incude Auger sputter profiling, X-ray photoelectron spectroscopy, secondary ion mass spectrometry, and Rutherford backscattering. The capabilities and limitations of Auger sputter profiling are considered especially with regard to sensitivity, spatial resolution, depth resolution, and chemical state determination. Although Auger sputter profilling is examined, the results are also applicable to X-ray photoelectron spectroscopy and secondary ion mass spectrometry. GRA

N82-19076# Atomic Energy Research Establishment, Harwell (England). Theoretical Physics Div.
ON THE CONDITIONS REQUIRED FOR VACANCY LOOP GROWTH IN IRRADIATED METALS AND ALLOYS
M. R. Hayns Jul. 1980 37 p refs
(AERE-R-9810) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A simple theoretical model is investigated which allows the conditions under which vacancy dislocation loop growth is possible to be examined. This forms an extension of previous work in that bulk defect recombination is not ignored and the effects of vacancy thermal emission are included. While the present work does not provide a kinetic model for vacancy loop growth it was possible to examine the criteria required for stable growth in some detail. The effects of network dislocation density, temperature, damage rate, the influence of other critical sinks, notably voids and grain boundaries, and interstitial dislocation loops were considered. The analog with the growth conditions for cavities as voids is highlighted. A detailed comparison with

experiment is not attempted as this is being considered separately. DOE

N82-19077# Tasmania Univ., Hobart (Australia).
TRANSIENT CONDUCTANCE SPECTROSCOPY MEASUREMENTS OF DEFECT STATES IN GAMMA-IRRADIATED N-CHANNEL SILICON FIELD EFFECT TRANSISTORS WITH POSSIBLE GAMMA-DOSEMETER APPLICATIONS
S. J. Pearton, A. J. Tavendale, and A. A. Williams Dec. 1980 14 p refs
(AAEC/E-504) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A deep level transient capacitance spectroscopy (DLTS) system, modified for the measurement of transient conductance, was used to observe gamma-ray induced defect centers in the gate junction of 2N4416 Si field effect transistors. The defect concentrations increased linearly with gamma-dose in the range 50 kGy to 1 x 10 to the 4th power kGy (5-1000 Mrad) for the common Esub(c) - 0.17 eV level, and in the range 500 kGy to 1 x 10 to the 4th power kGy (50-1000 Mrad) for the levels Esub(c) - 0.22 Ev and Esub(c) - 0.44 eV. Another common level, a hole trap at Esub(v) + 0.42 eV, was the only minority trap observed. The technique may be useful for measuring gamma-fluxes in situations inaccessible to standard dosemeters (e.g., flux-mapping). DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-19078# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RANDOM ANISOTROPY IN ISING SPIN GLASS
M. Cristina Forti, R. Kishore, and I. C. daCunhaLima Nov. 1981 18 p refs Submitted for publication
(INPE-2277-PRE/055) Avail: NTIS HC A02/MF A01

The theory of Ghatak and Sherrington for the Ising spin glass with uniform uniaxial anisotropy were extended for the random uniaxial anisotropy (RUA). The magnitude of the RUA is assumed to fluctuate randomly with Gaussian probability distribution. The susceptibility and the specific heat have been calculated for a system of spin one and zero mean values of the anisotropy and the exchange interaction. It is found that the random fluctuations of the anisotropy produce a cusp in the susceptibility and a broad maximum in the specific heat. Author

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

N82-19079*# Hampton Inst., Va.
THE 1981 SUMMER RESEARCH FELLOWSHIP PROGRAM Final Report, 1 Jun. - 7 Aug. 1981
John H. Spencer, comp. Oct. 1981 36 p refs
(Contract NAS1-16455)
(NASA-CR-165814) Avail: NTIS HC A03/MF A01 CSCL 05I

The NASA-Hampton Institute Summer Research Fellowship Program, offering capable scientists and engineers at traditionally black institutions an opportunity to participate in research activities in an environment at the Langley Research Center where basic research is of primary importance is considered. The Summer Research Fellowship Program, specifically designed to assist these faculty members in identifying areas of research which correlate positively with their individual interest and capabilities is discussed. It is also designed to help them to initiate viable research which increases their technical knowledge about how research efforts at their institutions might be increased. Author

N82-19080# Council on Environmental Quality, Washington, D.C.
THE GLOBAL 2000 REPORT TO THE PRESIDENT. ENTERING THE TWENTY-FIRST CENTURY, VOLUME 1
Gerald O. Barney 1981 59 p refs Prepared jointly with the State Dept. 3 Vol.
(PB82-100801) Avail: NTIS HC A04/MF A01; also available in set of 3 report HC E99 as PB82-100793 CSCL 05K

The President's directive establishing the Global 2000 Study called for a study of the probable changes in the world's population, natural resources, and environment through the end of the century and indicated that the Study as a whole was to serve as the foundation of our longer-term planning. To meet the objectives stated in the President's directive, the Global 2000 Study was designed not only to assess probable changes in the world's population, natural resources, and environment, but also, through the study process itself, to identify and strengthen the Government's capability for longer-term planning and analysis. GRA

N82-19081# Council on Environmental Quality, Washington, D.C.
THE GLOBAL 2000 REPORT TO THE PRESIDENT. ENTERING THE TWENTY-FIRST CENTURY, VOLUME 2
Gerald O. Barney 1981 779 p refs Prepared jointly with the State Dept. 3 Vol.
(PB82-100819) Avail: NTIS HC A99/MF A01; also available set of 3 reports HC E99 as PB82-100793 CSCL 05K

The basic plan for the Global 2000 Study was to identify the long-term global models currently used by Government agencies and to establish a set of uniform assumptions so that these models and tools could be used by the agencies' projection experts as a single, internally consistent system. Since the models and tools used are the ones now employed by the agencies in their long-term global analyses, they reflect the present foundation for long-term planning. GRA

N82-19082# Council on Environmental Quality, Washington, D.C.
THE GLOBAL 2000 REPORT TO THE PRESIDENT. DOCUMENTATION ON THE GOVERNMENT'S GLOBAL SECTORAL MODELS: THE GOVERNMENT'S GLOBAL MODEL, VOLUME 3
Gerald O. Barney, ed. 1981 412 p refs Prepared in cooperation with the State Dept. 3 Vol.
(PB82-100827) Avail: NTIS HC A18/MF A01; also available in set of 3 reports HC E99 as PB82-100793 CSCL 05K

This third volume of the Global 2000 Study presents basic information ('documentation' as it is termed by modelers) on the long-term sectoral models used by the U.S. Government to project global trends in population, resources and the environment. These models were the basis of the projections developed for the Global 2000 Study. Each of the sectoral models described in this volume is a Government developed or Government endorsed model. Most of the models were developed directly by Government agencies. Three of the models, the GNP model, the nonfuel minerals demand model, and one of the population models, were developed by non-Governmental organizations, but have been applied or recommended by one or more Government agencies as being the best models available for the particular types of projections they provide. GRA

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-19083*# National Aeronautics and Space Administration, Washington, D. C.
SELLING TO NASA
Oct. 1981 50 p
(NASA-TM-84136; NHB-5100.1D) Avail: NTIS HC A03/MF A01 CSCL 05A

The prospective NASA contractor is provided with information that describes the agency and its procurement practices. Products include ideas, manufacturing capabilities, fabricated components,

construction, basic materials, and specialized services. NASA assistance in marketing these and other products is emphasized. Small and minority business enterprises are discussed. The agency's scientific and technical information activities are also discussed. N.W.

N82-19084*# National Aeronautics and Space Administration, Washington, D. C.
NASA POCKET STATISTICS
Jan. 1982 70 p
(NASA-TM-84134) Avail: NTIS HC A04/MF A01 CSCL 05A

NASA program goals and objectives, major mission performance, USSR space flights, comparisons of the USA and USSR space records, and selected technical, financial, and manpower data are summarized. N.W.

N82-19085# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensberetch Raumfahrt.
MODERN MANAGEMENT IN CONSTRUCTION INDUSTRY OFFICES [MODERNES MANAGEMENT IN KONSTRUKTIONSBUERO]
B. J. Madauss 1981 38 p refs In GERMAN Presented at Deut. Konstruktionsleitertage 1981 Conf., Duesseldorf, West Germany, 25-26 May 1981
(MBB-UR-493-81-O) Avail: NTIS HC A03/MF A01

Contrasting expectations from management and designers in the construction industry were examined. Ways of problem solving are discussed. It is questioned if the designer can remain a creative problem solver under the pressure of cost effectiveness and time. Transl. by E.A.K.

N82-19086# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriiebsbereich.
COST PROBLEMS IN THE UTILIZATION PHASE OF A WEAPON SYSTEM [KOSTENPROBLEME IN DER NUTZUNGSPHASE DER WAFFENSYSTEME]
Gerd Laube 1981 23 p In GERMAN Presented at Wehrtechnik-Seminar, Bonn, 6-7 Apr. 1981
(MBB-UA-576-81-O) Avail: NTIS HC A02/MF A01

The origins of high material maintenance charges in the utilization of weapon systems, and how these can be reduced considerably through proper integrated logistics management during the development and optimization of the life cycle cost, was investigated. It is shown how up to 30% is saved in material maintenance costs for future systems in further development, more supply, or fast generation shifts. Transl. by E.A.K.

N82-19087# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
EFFECTIVE METHODS FOR OVERALL PROJECT COST REDUCTION [EFFEKTIVE VERFAHREN ZUR GESAMT-PROJEKTKOSTEN-REDUZIERUNG]
Bernd-J. Madauss 16 Oct. 1980 26 p refs Partly in GERMAN and ENGLISH Submitted for publication
(MBB-UR-456-80-O) Avail: NTIS HC A03/MF A01

Effective techniques for life cycle cost reduction are discussed. Life cycle cost, or total project cost are: development cost, production, import, operation and if necessary, termination of a system. The total cost analysis for a newly developed system, like airplanes of power plants, is introduced as early as possible to avoid errors, since not only the initial system purchase cost (development and construction), but also the later added expenses are of great importance. Effective measures for total project cost reduction are proposed. Transl. by E.A.K.

N82-19088# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
GROUND WORK FOR PROJECT ORGANIZATION IN DEVELOPMENT PROJECTS: EXPERIENCE IN SPACE FLIGHT [GRUNDSAETZE DER PROJEKTORGANISATION BEI ENTWICKLUNGSPROJEKTEN - ERFAHRUNGEN AUS DER RAUMFAHRT]
Bernd-J. Madauss 13 Jun. 1980 14 p In GERMAN
(MBB-UR-476-81-O) Avail: NTIS HC A02/MF A01

The principles of the project organization in development projects, especially in space technology, were examined. The following topics are discussed: high technological requirements; participation of national and international organizations; contractors; administration; industrial syndicate contracts; mission and responsibility of project management; necessary competence of project management; typical functions of the project organization in R&D projects in space technology; operational project organization; interindustrial project organization. Transl. by E.A.K.

N82-19089# Oxford Univ. (England). Dept. of Engineering Science.
CORPORATE ORGANIZATIONAL DESIGN AND ITS EFFECT ON INNOVATION
Kenneth Abel 1981 77 p refs
(PB82-108903; OUEL-1356/81) Avail: NTIS HC A05/MF A01 CSCL 05A

The factors which appear to influence the success for failure of technology innovation in today's large corporation and highly regulated environment were examined. The following topics are discussed: (1) why new products fail; (2) ventures and venturing; (3) the entrepreneur; (4) the organizational structure of successful innovation corporations; and (5) venture management and matrix concepts and their implementation. GRA

N82-19090# National Science Foundation, Washington, D. C. Div. of Science Resources Studies.
FEDERAL FUNDS FOR RESEARCH AND DEVELOPMENT, VOLUME 29, FISCAL YEARS 1979, 1980 AND 1981 Final Report
Jan. 1981 59 p refs
(PB82-118902; NSF-81-306) Avail: NTIS HC A04/MF A01 CSCL 05A

The report covers Federal agency R&D funding, as shown in the 1981 revised budget. The analysis covers R&D program levels for 1979-81, focusing on relative changes from 1980 to 1981, after the budget revision, with indications of subsequent congressional appropriation actions, where known. It includes data on basic research, applied research, and development; on performers of R&D work (intramural, industrial, university-and-college, etc.); on research by fields of science; and R&D data for 1979 by geographic (State) distribution. The publication includes a section on R&D funding by budget function (national defense, space, health, energy, etc.) in the 1981 budget and in prior years and another section on Federal R&D support to performers since 1955 with special emphasis on university-and-college support. GRA

N82-19091# General Accounting Office, Washington, D. C. Accounting and Financial Management Div.
NON-FEDERAL COMPUTER ACQUISITION PRACTICES PROVIDE USEFUL INFORMATION FOR STREAMLINING FEDERAL METHODS Report to Congress .
2 Oct. 1981 34 p refs
(PB82-120924; AFMD-81-104) Avail: NTIS HC A03/MF A01 CSCL 05A

Eighteen non-Federal organizations showed that their managers are committed to using the computer effectively as a tool for achieving business goals. Their strategies and plans provide a framework and operational direction for computer acquisitions. Their practices and procedures are understood, followed, and consonant with normal business practices. GAO found that the 18 organizations studied normally completed computer equipment acquisitions in under a year. The study discusses their practices and procedures. While GAO does not endorse the specific procurement practices, it is believed Federal agencies should consider using the other practices to streamline their acquisition processes within the context of current laws and regulations. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-19092# Loughborough Univ. of Technology (England).
FULL TEXT INFORMATION SYSTEMS: A REVIEW AND

ASSESSMENT OF THE TECHNOLOGY M.S. Thesis
John W. T. Smith 1980 150 p refs
Copyright. Avail: Issuing Activity

The technologies and systems that could be used to implement a future full text information system are considered. Systems that can be considered as stand alone full text information systems, each unit capable of serving a limited number of users, are discussed. These are evaluated for their access times, storage capacity, and their ability to be interconnected with other information processing equipment and communication systems. Technologies that could be used to link some of them together to form a large, even global full text information system are discussed. The 'state of the art' of full text information systems is reviewed and three possible scenarios for the development of such systems are advanced. N.W.

N82-19093# Instituut TNO voor Wiskunde, Informatieverwerking en Statistiek, The Hague (Netherlands).
CONTINUATION OF INFORMATION TRACKS RESEARCH: INVENTOR OF PROSPECTS [VOORTZETTING VAN HET INFORMATIESPOREN ONDERZOEK: INVENTARISATIE VAN PERSPECTIEVEN]
C. A. Benschop and T. DeHeer Aug. 1980 27 p refs In DUTCH
(IWIS-A-80-IN-62-18) Avail: NTIS HC A03/MF A01

An advanced retrospective retrieval system in which the information tracing method is combined with conventional search methods is reported. The current method and its algorithms was investigated which resulted in a new users guide. Possibilities are examined for implementation of large program components. Transl. by E.A.K.

N82-19094# Research Inst. of National Defence, Stockholm (Sweden). Huvudavdelning 2.
COMMON DATA BASE EXPERIMENT: PROGRESS REPORT ON DATA ANALYSIS Progress Report
Gunnel Barkeby, Nils-Olov Bergkvist, Ola Dahlaman, Peder Johansson, Harriet Ohlsson, and Falguni Roy (Bhabha Atomic Research Centre, Bombay) Nov. 1981 78 p refs Presented at Comm. on Disarmament Seismic Expert Group Meeting, Geneva, Aug. 1981
(FOA-C-20431-T1) Avail: NTIS HC A04/MF A01

Bulletins and wave form data from stations linked to an international seismic data bank are presented as a step towards establishing an international verification system. Epicenter locations by array stations prove valuable for the assocation of arrival times and for the definition of events. Estimated depth remains an uncertain source parameter. Data on magnetic tapes are not fully exploited because the lack of standards for tape formats and tape format descriptions makes them difficult to read. Long period data can be extrapolated from short period recordings. Author (ESA)

N82-19095# Mitre Corp., McLean, Va.
THE INTEGRATED LIBRARY SYSTEM (ILS): USER MANUAL
Sandy E. Selander, Elizabeth A. Payne, Gary Freiburger, and Linda B. Brogan Jul. 1981 292 p
(Contract N01-LM-0-3526)
(PB82-114968; NLM/DF-81/003A; NLM/LHC-CR-81-06) Avail: NTIS HC A13/MF A01 CSCL 05B

The Integrated Library System (ILS) is a minicomputer based library automation system designed to support a full range of technical processing and retrieval activities using a single master bibliographic file (MBF). This document presents a full user manual for all ILS functions that are available in ILS Version 2.0. The text in this document is identical to the online HELP text provided with the ILS software, but has been somewhat reorganized here into a format more suitable for a printed document. GRA

N82-19096# Mitre Corp., McLean, Va.
ARMY LIBRARY CONVERSION: COST ASSESSMENT PLAN
Joan S. Lovelace 1981 37 p ref Sponsored in part by National Library of Medicine, National Institutes of Health, Public Health Service and Dept. of Health and Human Services
(Contract N01-LM-8-4720)
(PB82-120353; WP-79W00237; LHNCBC-CR-81-11) Avail: NTIS HC A03/MF A01 CSCL 05B

A work plan for gathering cost data at the Army Library during conversion of its manual circulation system to the automated circulation module of the Integrated Library System (ILS) is presented. The plan describes the activities to be studied, discusses the costs involved and outlines how these will be collected and reported. GRA

N82-19097# National Oceanic and Atmospheric Administration, Washington, D. C. Environmental Data and Information Service.
DIRECTORY OF THE NOAA LIBRARY AND INFORMATION NETWORK Key to Oceanic and Atmospheric Information Sources
Dec. 1980 26 p refs
(PB82-114869; KOAIS-2; NOAA-81082505) Avail: NTIS HC A03/MF A01 CSCL 05B

The Directory of the NOAA Library and Information Network describes the services provided by NOAA Libraries and Information Centers in the Washington, DC area, at Miami and Coral Gables, FL., and Boulder, CO., and by over 300 other libraries and information centers that serve principal organizational elements of NOAA's major line components. Arrangement is in alphabetical sequence by major line components or major program elements, except for the Environmental Data and Information Service, the Environmental Research Laboratories, and the National Marine Fisheries Service, where organization hierarchy (EDIS and ERL) or geographic locations (NMFS) were considered. GRA

N82-19098# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
ON EMPIRICAL FOUNDATIONS OF INFORMATION SCIENCE Final Report
Pranas Zunde Jul. 1981 654 p refs
(Grant NSF DSI-77-05297)
(PB82-125998; GIT-ICS-81/14) Avail: NTIS HC A99/MF A01 CSCL 05B

Pertinent empirical laws and hypothesis which have been reported in scientific and technical literature were catalogued, described, and analyzed for their dependencies and relations. A body of knowledge derived from empirical observations of information phenomena and representative of information science as a distinct scientific discipline was identified. Concepts such as information value, relevance, aging of information, growth of knowledge, obsolescence, information scatter, productivity of information sources and information flow are considered. Over 300 empirical laws and hypotheses were selected, analyzed, and catalogued. Each of these laws was indexed by a set of terms (keywords) reflecting every significant concept (construct) in the statement of the law or hypothesis. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-19099# Strasbourg Univ. (France). Bureau d'Economie Theorique et Appliquee.
THE YEARLY EFFECT OF THE ACTIVITIES OF THE EUROPEAN SPACE AGENCY: ESTIMATION OF TAX REVENUES DUE TO THE ACTIVITIES OF ESA AND OF THE RESULTING GLOBAL SHORT TERM ECONOMIC IMPACT. VOLUME 2: MAIN REPORT [L'INCIDENCE FISCALE DES ACTIVITIES DE L'AGENCE SPATIALE EUROPEENE. ESTIMATION DU RETOUR D'IMOP IMPUTABLE A 'ACTIVITE DE L'ESA ET DE L'IMPACT ECONOMIQUE GLOBAL A COURT TORME DONT IL EST ISSU. VOLUME 2: RAPPORT PRINCIPAL]
Jean-Alain Heraud and Ehud Zusconitch Paris ESA Jan. 1981 80 p In FRENCH
(Contract ESA-3702/78/F-DKR(SC))
(ESA-CR(P)-1472) Avail: NTIS HC A05/MF A01

The effect of ESA activities on the public was evaluated by a two step procedure. The total economic impact of space expenditures was assessed and the supplemental national revenue thus created which returned to the member states by simple fiscal tension was determined. The results prove that macroeconomic benefit obtained by the assembly of member nations from their involvement in ESA activities is substantial. The mean value of the rate of return of taxes shows that space activity represents a self remunerative activity for the public treasury.
A.R.H.

N82-18131# Societe Nationale Industrielle Aerospatiale, Marignane (France.) Helicopter Div.
PARAMETRIC STUDY OF THE INFLUENCE OF THE ENGINE UPON THE OPERATING COST OF A CIVIL HELICOPTER
Gilbert Beziac, Jean-Pierre Dedieu, and Philippe Cabrit *In* DGLR Seventh European Rotorcraft and Powered Lift Aircraft Forum 1981 5 p (For primary document see N82-18119 09-01)
Avail: NTIS HC A99/MF A01

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-19100# Air Force Systems Command, Andrews AFB, Md. Office of the Staff Judge Advocate.
PATENT ABSTRACT DIGEST, VOLUME 1 Interim Report
Frank A. Lukasik 30 Apr. 1979 95 p 3 Vol.
(AD-A108672; AFSC-TR-81-65) Avail: NTIS HC A05/MF A01 CSCL 05/2
One page summaries of new technology generated under Air Force programs and protected by issued U.S. patents are presented. Each of the 92 entries consists of a citation, an abstract, and in most cases, a key illustration selected from the patent.
GRA

N82-19101# Air Force Systems Command, Andrews AFB, Md. Office of the Staff Judge Advocate.
PATENT ABSTRACT DIGEST, VOLUME 2 Interim Report
Frank A. Lukasik Mar. 1981 111 p 3 Vol.
(AD-A108673; AFSC-TR-81-66) Avail: NTIS HC A06/MF A01 CSCL 05/2
One page summaries of new technology generated under Air Force programs and protected by issued U.S. patents are presented. Each of the 108 entries consists of a citation, an abstract, and in most cases, a key illustration selected from the patent.
GRA

N82-19102# Air Force Systems Command, Andrews AFB, Md. Office of the Staff Judge Advocate.
PATENT ABSTRACT DIGEST, VOLUME 3 Interim Report
Frank A. Lukasik Sep. 1981 114 p 3 Vol.
(AD-A108674; AFSC-TR-81-67) Avail: NTIS HC A06/MF A01 CSCL 05/2
One page summaries of new technology generated under Air Force programs and protected by issue U.S. patents are presented. Each of the 111 entries consists of a citation, an abstract, and in most cases, a key illustration selected from the patent.
GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-19103*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. Technology Utilization Office.
NASA TECHNOLOGY UTILIZATION HOUSE TECHNICAL SUPPORT PACKAGE SUMMARY OF RESULTS AND HOUSE DESCRIPTION Final Report
Aug. 1979 83 p
(NASA-TM-X-74686) Avail: NTIS HC A05/MF A01 CSCL 13M
The Technology Utilization House (Tech House) was designed and constructed to demonstrate to the building industry and the public the benefits of aerospace technology and other new technology that are presently available or will be in very near future. Use of solar energy, conservation of energy and of water, safety, and security were incorporated in the design of the house. The terms to be incorporated into the house and to assist in the design of the house were evaluated. An architectural engineering team was employed to investigate energy conservation ideas, determine cost effectiveness of new materials and systems, and prepare specifications and drawings for the house. The Tech House was constructed during the spring of 1976. All the systems were monitored to insure proper operation, and data were collected during a one year occupancy. Results obtained during the family live-in period, comments on the acceptance of the various energy-saving systems by the family, and suggestions for improvement of the systems are presented.
N.W.

N82-19104# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
MOBILITY BIBLIOGRAPHY
N. Liston, comp., M. Hutt, comp., and L. White, comp. Nov. 1981 333 p Prepared in cooperation with the International Society for Terrain-Vehicle Systems
(AD-A108228; CRREL-SR-81-29) Avail: NTIS HC A15/MF A01 CSCL 15/5
This bibliography is an international compilation of literature relating to terrain vehicles, amphibious vehicles, snow vehicles, air cushion vehicles, tracked vehicles, wheeled vehicles, and off-road vehicles. It also covers the related subjects of rolling resistance, traction, snow strength measurement, soil strength measurement, terrain analogs, vehicle models, and the overall topic of vehicle mobility. It is not comprehensive but begins at about 1970 and ends in 1980. The European coverage is lacking because much of this material is not accessible by computerized literature searching, which was the mechanism used for compiling this bibliography.
Author (GRA)

N82-19105# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Betriebsbereich.
RELIABILITY METHODOLOGY IN TASK IDENTIFICATION FOR THE DEVELOPMENT OF NEW TRANSPORTATION SYSTEMS [SICHERHEITSMETHODISCNE ARBEITSWEISEN BEI DER ENTWICKLUNG NEUARTIGER VERKEHRSSYSTEME]
Wolf-Dieter Pilz 15 May 1981 26 p refs In GERMAN Presented at 2nd Tech. Zuverlaessigkeit Session, Nuernberg, 13-15 May, 1981
(MBB-UR-473-81-O) Avail: NTIS HC A03/MF A01
The development of new technologies, especially in new tranportation systems, is discussed. Safety engineering and reliability in labor methods are emphasized. The following topics are discussed: the present situation in operation methods; a proposal for a safety methods in labor operations; systematic evaluation of structural conditions; deriving a general action scheme; fundamental considerations; critical safety methods in production engineering; logics of action schemes.
Transl. by E.A.K.

N82-19106# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
INTEGRATING PROJECT WORTHINESS INTO A COST-EFFECTIVENSS FRAMEWORK FOR ALTERNATIVE ANALYSIS
Joseph L. Schofer, Mark A. Turnquist, and Steven E. Polzin Feb. 1981 175 p refs
(Contract UMTA-IL-11-0026)
(PB82-113895; UMTA-IL-0026-81-1) Avail: NTIS HC A08/MF A01 CSCL 13B
The conflicting goals held for alternatives analysis in major capital investments proposed for urban transit systems and the

lack of adequate concern in the evaluation for project worthiness, the relationship between monetary benefits and costs of options are discussed. A conceptual framework for integrating cost-effectiveness and worthiness analysis is developed. Some pragmatic limitations of worthiness analysis are discussed. An integrated approach to the evaluation in Alternatives Analysis is presented and related to an interactive graphics computer software system developed for accomplishing this task. GRA

N82-19107# United States Conference of Mayors, Washington, D.C.
URBAN DATA FOR COMPARATIVE ANALYSES OF CITIES
25 Mar. 1981 38 p refs
(Grant HUD-H-5044RG)
(PB82-125675; HUD-0001996) Avail: NTIS HC A03/MF A01 CSCL 13B

A blueprint of the establishment of a national urban data information system is provided. Findings from a survey conducted in 20 cities on information needed to design a statistically valid approach to obtaining comparative data on cities are presented. These data would help in the urban policy decision-making process. Such comparisons also may be used to analyze the 'quality of life' in the urban environment, to describe urban conditions, and to analyze casual connections among various factors. The survey had four purposes: to determine the extent to which localities generate their own data on items used to determine eligibility and allocations of Federal funds; to contrast local data with the most recent Federal statistics; to determine whether Federal programs use different statistics for the same data items; and to obtain suggestions for improving the system by which local and Federal data are used for policymaking decisions regarding the allocation of Federal funds. GRA

N82-19108# International New Towns Association, Hague (Netherlands).
FOURTH ANNUAL COMMUNITY PLANNING AND DEVELOPMENT CHALLENGES: ENERGY, ENVIRONMENT, WATER
Columbia, S.C. Mar. 1981 95 p refs Proceedings of Conf. held in Cairo, 6-14 Oct. 1980
(Grant HUD-H-5371RG)
(PB82-125790; HUD-0002055) Avail: NTIS HC A05/MF A01 CSCL 13B

The Egyptian government's commitment to a massive new towns program was noted. Free standing new towns, solely dependent upon employment growth, were discussed. National energy conservation policies were seen as effective only through price mechanisms. Research and development programs on new technologies were considered more effective on smaller rather than larger scales. Governments were seen as not facing up to the political problems of rapid urbanization. The capacity of the infrastructure of existing cities was seen as not keeping up with growing demand in developing countries. GRA

N82-19109# SRI International Corp., Menlo Park, Calif.
CENTRAL CONTROL SYSTEM SURVEY Final Report, Dec. 1979 - Jun. 1980
Bjorn Conrad, Masami Sakasita, and Marilyn Sanfilippo May 1981 137 p refs Sponsored in part by Bay Area Rapid Transit District
(SRI-Proj. 1529)
(PB82-101981; UMTA-CA-06-0124-81-1) Avail: NTIS HC A08/MF A01 CSCL 13B

The advances in control technology, such as displays, communication systems, control algorithms, and to what extent automation can facilitate rapid transit operations were examined. The survey focused on the central control functions of schedule creation, schedule implementation, schedule maintenance, and failure management. These functions tend to have the most direct impact on system performance. The five properties surveyed were the Chicago Transit Authority (CTA), the Massachusetts Bay Transit Authority (MBTA), the New York City Transit Authority (NYCTA), the Washington Metropolitan Area Transit Authority (WMATA), and the Bay Area Rapid Transit District (BART). GRA

N82-19110# California Dept. of Health Services, Berkeley. Sanitary Engineering Section.
DESIGN OPTIMIZATION OF THE CHLORINATION PROCESS. VOLUME 1: COMPARISON OF OPTIMIZED PILOT SYSTEM WITH EXISTING FULL SCALE SYSTEMS Final Report, Feb. 1977 - Sep. 1979
Endel Snepp and Paul Bao Sep. 1981 135 p refs
(Grant EPA-S-803459)
(PB82-100835; EPA-600/2-81-167-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 13B

Parallel wastewater effluent chlorination studies were done on a mobile optimized chlorination pilot system and the full scale system at eight different treatment plants. Disinfection efficiency was measured by total coliform enumeration and chlorine residual tests. Parallel flow through fish bioassays were also conducted at each location. Achievement of adequate disinfection with minimum use of chlorine, reduction of chlorine induced toxicity, and writing of a design manual were emphasized. All seven of the eight plants studied the optimized pilot plant achieved an equivalent level of disinfection with significantly lower chlorine dosage, in some cases more than 50% lower than the full scale plants. The pilot plant chlorine residuals were also lower by the same proportions. GRA

N82-19111# Soil Conservation Service, Washington, D. C.
WASTEWATER TREATMENT FACILITIES-SLUDGE MANAGEMENT SYSTEM, ALBUQUERQUE, NEW MEXICO Supplemental Draft Environmental Impact Statement
Sep. 1981 266 p refs
(Contract EPA-68-01-5991)
(PB82-117029; EPA-906/9-81-003) Avail: NTIS HC A12/MF A01 CSCL 13B

The City of Albuquerque proposes a sludge management system consisting of sludge thickening and stabilization units at Treatment Plant No. 2, followed by transfer of sludge via pipelines to Montesa Park where the sludge will be mechanically dewatered, dried in a solar greenhouse, disinfected by irradiation with Ceslium-137, and disposed by landspreading on public lands. EPA has evaluated the City's proposal and 13 additional alternatives. GRA

88 SPACE SCIENCES (GENERAL)

N82-19112# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
RELATIVISTIC EFFECTS IN THE SOLAR SYSTEM
Erich R. Bagge 1981 47 p refs
(IFKKI-81/2) Avail: NTIS HC A03/MF A01

The relativistic velocity of the planet Mercury and of starlight as it passes the Sun is addressed. The deviation of the refracted light beam and the orbital velocity of the planet are calculated. For individual titles, see N82-19113 through N82-19114.

N82-19113# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
PART 1: RELATIVISTIC PATHWAY MODIFICATION OF THE PLANETS **c91**
In its Relativistic Effects in the Solar System 1981 26 p (For primary document see N82-19112 09-88)
Avail: NTIS HC A03/MF A01

It is shown that Mercury's perihelion motion around the Sun, which until now is explicable quantitatively only by General Relativity, can be understood within the framework of the dynamics of Special Relativity. The relativistic dependance of the planet's mass on its velocity is taken into account as well the acceleration terms of the equations of motion. The numeric solution of these equations for the planet Mercury gives a motion of its perihelion which is in good conformity with the observations and with the results of General Relativity. J.M.S.

N82-19114# Kiel Univ. (West Germany). Inst. fuer Reine und Angewanndte Kernphysik.
PART 2: THE DEFLEXION OF STARTLIGHT BY THE SUN **c92**
In its Relativistic Effects in the Solar System 1981 18 p refs (For primary document see N82-19112 09-88)

Avail: NTIS HC A03/MF A01

It is shown that the deviation of starlight in passing the Sun which until now appears to be explicable only by General Relativity, can be understood as a quasi-classical effect of light refraction. It is only necessary to transfer the formulas for the dielectric polarizability of the vacuum proposed in earlier papers in a physically plausible manner to the case of corresponding polarization effect in gravitational fields. The resulting refraction index for light in gravitational field gives for the Sun a deviation in good conformity with the observations and the results of General Relativity. From these considerations it can be deduced also that the velocity of a horizal light beam at 10000 km above ground level on the Earth has a velocity deficit of 5,730 cm/sec if one compared it with the corresponding velocity at ground level. J.M.S.

N82-19115# Analytic Services, Inc., Arlington, Va. Space Div.

THE PREDICTION OF SATELLITE EPHEMERIS ERRORS AS THEY RESULT FROM SURVEILLANCE SYSTEM MEASUREMENT ERRORS

Bowen Eugene Simmons Aug. 1981 138 p refs

(Contract F49620-77-C-0025)

(AD-A108477; ANSER-SPDN-80-4) Avail: NTIS HC A07/MF A01 CSCL 22/3

This report derives equations predicting satellite ephemeris error as a function of measurement errors of space-surveillance sensors. These equations lend themselves to rapid computation with modest computer resources. They are applicable over prediction times such that measurement errors, rather than uncertainties of atmospheric drag and of Earth shape, dominate in producing ephemeris error. This report describes the specialization of these equations underlying the ANSER computer program, SEEM (Satellite Ephemeris Error Model). The intent is that this report be of utility to users of SEEM for interpretive purposes, and to computer programmers who may need a mathematical point of departure for limited generalization of SEEM. Author (GRA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-19116*# Delaware Univ., Newark.

THEORETICAL STUDIES OF THE RS CANUM VENATICORUM STARS Final Report, 1 Jan. 1980 - 31 Dec. 1981

Dermott J. Mullan 23 Feb. 1982 49 p refs

(Grant NAGw-5)

(NASA-CR-168549) Avail: NTIS HC A03/MF A01 CSCL 03A

The activity in RS Canum Venaticorum (CVn) is investigated. Models for chromospheric structure are developed and the role of magnetic fields both in the photosphere as well as in the chromosphere and upper atmosphere are examined. T Tau stars are also studied from the same points of view. The properties of magnetic field loops are used to help understand the atmospheric structure in RS CVn stars. The concepts developed in the case of these stars appear to be applicable over a much broader region of the HR diagram. The absence of stable magnetic loops in the atmospheres of late type giant stars suggests that the atmospheres of RS CVn active components are qualitatively distinct from the solar atmosphere. S.L.

N82-19117*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LOW-BACKGROUND PERFORMANCE OF A MONOLITHIC InSb CCD ARRAY

J. D. Bregman, J. H. Goebel, C. R. McCreight, and T. Matsumoto Jan. 1982 39 p refs

(NASA-TM-84216; A-8831) Avail: NTIS HC A03/MF A01 CSCL 03A

A 20 element monolithic InSb charge coupled device (CCD) detector array was measured under low background conditions to assess its potential for orbital astronomical applications. At a temperature of 64 K, previous results for charge transfer efficiency (CTE) were reproduced, and a sensitivity of about 2 x 10 to the minus 15th power joules was measured. At 27 and 6 K, extended integration times were achieved, but CTE was substantially degraded. The noise was approximately 6000 charges, which was in excess of the level where statistical fluctuations from the illumination could be detected. A telescope demonstration was performed showing that the array sensitivity and difficulty of operation were not substantially different from laboratory levels. Ways in which the device could be improved for astronomical applications were discussed. Author

N82-19118*# Johns Hopkins Univ., Baltimore, Md. Dept. of Physics.

A PHOTON-COUNTING PHOTODIODE ARRAY DETECTOR FOR FAR ULTRAVIOLET (FUV) ASTRONOMY

G. F. Hartig, H. W. Moos, R. Pembroke, and C. Bowers [1982] 8 p refs

(Contracts NAS5-27000; NAS5-26057; Grant NAGw-16)

(NASA-CR-168551) Avail: NTIS HC A02/MF A01 CSCL 03A

A compact, stable, single-stage intensified photodiode array detector designed for photon-counting, far ultraviolet astronomy applications employs a saturable, 'C'-type MCP (Galileo S. MCP 25-25) to produce high gain pulses with a narrowly peaked pulse height distribution. The P-20 output phosphor exhibits a very short decay time, due to the high current density of the electron pulses. This intensifier is being coupled to a self-scanning linear photodiode array which has a fiber optic input window which allows direct, rigid mechanical coupling with minimal light loss. The array was scanned at a 250 KHz pixel rate. The detector exhibits more than adequate signal-to-noise ratio for pulse counting and event location. A.R.H.

N82-19119# Spectron Development Labs., Inc., Costa Mesa, Calif.

FLOW VELOCITY AND ANGULARITY MEASUREMENTS IN THE FDL TRISONIC GASDYNAMIC FACILITY AND SELF-ADAPTIVE WALL WIND TUNNELS WITH A LASER TRANSIT ANEMOMETER Final Report, Apr. - Nov. 1980

William T. Mayo, Jr., A. E. Smart, R. J. Hermes, and J. D. Trolinger Wright-Patterson AFB, Ohio AFWAL Aug. 1981 143 p refs

(Contract F33615-79-C-3030; AF Proj. 2402)

(AD-A108427; SDL-81-2162-05FR; AFWL-TR-81-3081) Avail: NTIS HC A07/MF A01 CSCL 14/2

The measurement of a backscatter laser transit anemometer was tested in the FDL Trisonic Gasdynamics Facility (TGF) and the nine-inch Self Adapting Wall (SAW) wind tunnel. The tests included flow analysis in the two foot by two foot subsonic, transonic and supersonic test sections as well as the fifteen-inch transonic test section insert all in the TGF. The magnitude and flow angle precisions were as good as 0.3% and 0.3 deg, respectively, as limited by the statistical fluctuations of the data. Calculations indicate that the minimum natural particle size observed in the TGF was approximately 0.2 micron in diameter. Flow speed and angle were mapped about a microfighter flow field in the TGF fifteen-inch transonic test section at Mach number 0.7 and 0.9 to develop a data base for evaluation of the Self Adaptive Wall wind tunnel concept. Measurements were then made to the same model in the FDL nine-inch Self Adaptive Wall wind tunnel. These indicated that the precision of the instrument exceeded the current precision to establish and repeat flow conditions in the tunnel. The SAW results indicated non-uniform particle content of the flow which adversely affected the available angle precision; however, velocity measurements were good. Presentation of the equipment and measurement results of the present project are included. GRA

N82-18249*# California Univ., Berkeley.

FAR ULTRAVIOLET ASTRONOMY USING THE FAUST TELESCOPE

C. S. Bowyer *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03A

N82-18251*# European Space Technology Center, Delft (Netherlands).

SPECTROSCOPY IN X-RAY ASTRONOMY
R. Andresen *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)
Avail: NTIS HC A08/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-19120*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENTAL AND THEORETICAL STUDIES OF INTERSTELLAR GRAINS Ph.D. Thesis - Maryland Univ., College Park, 1982
Joseph A. Nuth, III Dec. 1981 260 p refs
(NASA-TM-83883) Avail: NTIS HC A12/MF A01 CSCL 03B

Steady state vibrational populations of SiO and CO in dilute black body radiation fields were calculated as a function of total pressure, kinetic temperature and chemical composition of the gas. Approximate calculations for polyatomic molecules are presented. Vibrational disequilibrium becomes increasingly significant as total pressure and radiation density decrease. Many regions of postulated grain formation are found to be far from thermal equilibrium before the onset of nucleation. Calculations based upon classical nucleation theory or equilibrium thermodynamics are expected to be of dubious value in such regions. Laboratory measurements of the extinction of small iron and magnetite grains were made from 195 nm to 830 nm and found to be consistent with predictions based upon published optical constants. This implies that small iron particles are not responsible for the 220 nm interstellar extinction features. Additional measurements are discussed. R.J.F.

N82-19121# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
A WORST CASE SPACECRAFT ENVIRONMENT AS OBSERVED BY SCATHA ON 24 APRIL 1979
E. G. Mullen, M. S. Gussenhoven, and H. B. Garrett 31 Jul. 1981 38 p refs
(AF Proj. 7661)
(AD-A108680; AFGL-TR-81-0231; AFGL-ERP-751) Avail: NTIS HC A03/MF A01 CSCL 03/2

A survey of data from the first year of the P78-2 SCATHA satellite operations showed that a highest level spacecraft frame charging (phi sub f) both in sunlight (-340 V) and in eclipse > -8 kV) occurred on 24 April 1979. Analysis of the data indicates that if the sunlight charging environment had been present during eclipse, the vehicle would have charged in excess of 15 kV which is above any known charging level observed to date for the SCATHA satellite. Therefore, the environment at the peak of the sunlight charging at approx. 0650 UT 24 April 1979 was chosen for this worst case study. The environment at this time is characterized by an injection of high energy (30-335 keV) electron fluxes whose combined current correlates with phi sub f with a correlation coefficient of 0.95. The fluxes were highly anisotropic, maximizing perpendicular to the magnetic field. The low energy (< 4 keV) electron population had a density < 1/cc and the low energy ions were near background. Author

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-19122*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANETARY MAGNETOSPHERES
David P. Stern and Norman F. Ness Oct. 1981 45 p refs Submitted for publication
(NASA-TM-83841) Avail: NTIS HC A03/MF A01 CSCL 03B

A concise overview is presented of our understanding of planetary magnetospheres (and in particular, of that of the Earth), as of the end of 1981. Emphasis is placed on processes of astrophysical interest, e.g., on particle acceleration, collision-free shocks, particle motion, parallel electric fields, magnetic merging, substorms, and large scale plasma flows. The general morphology and topology of the Earth's magnetosphere are discussed, and important results are given about the magnetospheres of Jupiter, Saturn and Mercury, including those derived from the Voyager 1 and 2 missions and those related to Jupiter's satellite Io. About 160 references are cited, including many reviews from which additional details can be obtained. Author

N82-19123*# Howard Univ., Washington, D. C. Dept. of Chemistry.
LABORATORY MEASUREMENTS OF COMETARY PHOTOCHEMICAL PHENOMENA
William M. Jackson 4 Dec. 1981 23 p refs
(Grant NsG-5071; Contract N00014-80-C-0305)
(NASA-CR-168506; AD-A108614; TR-8) Avail: NTIS HC A02/MF A01 CSCL 07/5

Laboratory experiments are described that provide fundamental information about photochemical processes in comets. The yield of cometary radicals such as CN, OH, etc., can be determined as a function of photolyzing wavelength. Quantum state distributions of the internal energy of the cometary radicals can also be measured as a function of wavelength permitting one to define the recoil velocity of the fragments. This type of information supplies the data needed for more elaborate models to interpret the data being obtained on comets. GRA

N82-19113# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
PART 1: RELATIVISTIC PATHWAY MODIFICATION OF THE PLANETS
In its Relativistic Effects in the Solar System 1981 26 p (For primary document see N82-19112 09-88)
Avail: NTIS HC A03/MF A01

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-19124# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
Mm- TO cm-WAVELENGTH TIME DELAYS IN SOLAR BURST EMISSION BURST EMISSION AND THE EFFECT OF VARYING MAGNETIC FIELD
J. E. R. Costa and P. Kaufmann Nov. 1981 30 p refs Submitted for publication
(INPE-2278-PRE/056) Avail: NTIS HC A03/MF A01

Certain solar bursts measured in the mm to cm wave range of frequencies present maximum emission not coincident in time. In some cases the emission is delayed towards lower frequencies which is in apparent contradiction with what would be expected in geometries commonly assumed in thermal models. An explanation is given which places the primary source at the top of a magnetic loop, the collisionless fronts formed moving downwards into the solar chromosphere with the addition of time varying magnetic field effects. The explanation predicts observed time delays for wavelengths situated in the optically thin part of the gyrosynchrotron burst emission spectrum. J.M.S.

N82-19125# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TIME DELAYS IN SOLAR BURSTS MEASURED IN THE mm-cm RANGE OF WAVELENGTHS
P. Kaufmann, J. E. R. Costa, and F. M. Strauss Oct. 1981 36 p refs Submitted for publication Sponsored in part by FINEP and FAPESP

(INPE-2251-PRE/034) Avail: NTIS HC A03/MF A01

Various solar bursts were analysed with high sensitivity (0.03 s.f.u., r.m.s.) and high time resolution (1 ms) at two frequencies in the millimeter wave range (22 GHz and 44 GHz) and with moderate time resolution (100 ms) by a patrol telescope at a frequency in the microwave range (7 GHz). It was found that in most cases burst maximum emission is not coincident in time at those frequencies. Preceding maximum emission can be either at the higher or at the lower frequency. Time delays ranged from about 3 sec to near coincidence, defined within 10 ms. Some complex bursts presented all kinds of delays among different time structures, and sometime nearly uncorrelated time structures. Directional particle accelerations in complex magnetic configurations could be considered to explain the variety of the dynamic effects. Fastest burst rise times observed of 10ms at 44GHz and 40 ms at 22 GHz, might be associated to limiting formation times of emission sources combined to various absorption mechanisms at the source and surrounding plasma. Author

N82-19126# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.

RESULTS OF SUN MEASUREMENTS AT THE METSAEHOVI RADIO RESEARCH STATION AT 37 GHz (AUTUMN 1978)

Seppo Urpo 1979 46 p refs

(Rept-S-115; ISBN-951-751-905-2) Avail: NTIS HC A03/MF A01

Results of Sun radiation measurements at 8mm (37 GHz), performed with a 13.7m radome covered dish, are presented. Several high resolution maps of the whole Sun were drawn by computer plotter. The development of typical active areas over the course of several days is depicted. Both high temperature and low temperature areas, as compared with the estimated quiet Sun level, were detected. Microwave bursts related with flare activity in the McMath region 15551 were measured. The power spectrum analysis of the large burst reveals quasi-periodic fluctuation. During the 8mm burst, the period of this fluctuation decreased constantly from 2.5 to 2.1 seconds. Maps of the whole Sun, enlargements of active areas and low temperature areas, and plots of spectra are shown. Author (ESA)

N82-19127# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.

SOLAR BURSTS MEASURED AT 8 MM WAVELENGTH

Seppo Urpo and Koistinen Olavi 1980 16 p refs

(Rept-S-122; ISBN-951-752-226-6) Avail: NTIS HC A02/MF A01

About thirty major solar microwave bursts, detected by tracking those active areas expected to produce such bursts, are reported. These were detected using a 14m radio telescope with an 8mm receiver, center frequency 36.8 GHz, and analyzed over a two year period. In order to select promising areas for tracking, maps of solar radiation of 8mm were measured at least once a day by scanning in right ascension and changing the declination between subsequent scans. The center of the selected active region was tracked with the telescope beam (2.4 arc min) to record possible bursts before, during, and after occurrence. Statistics of active region tracking are given and observed microwave bursts are listed. Author (ESA)

N82-19128# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.

DEVELOPMENT OF THE SOLAR ACTIVE REGION 2684 AT 8 MM WAVELENGTH, SEPTEMBER 22 - 27, 1980

Seppo Urpo 1981 11 p Presented at Crimean FBS/SERF Workshop on Solar Maximum Year, Crimea, USSR, Mar. 1981

(Rept-S-123; ISBN-951-752-227-4) Avail: NTIS HC A02/MF A01

Results of the daily monitoring of the solar active region 2684 at 8mm wavelength using a 14m millimeter wave radiotelescope, are discussed. An increase in 8mm radiation to the value of 8 Sfu, and its subsequent rapid decay, are noted. Eight maps of the whole Sun measured on the six days in question, and figures showing the development of the active region 2684, are presented together with results of the three day tracking of the active region. Author (ESA)

N82-18253*# Institut Royal Meteorologique de Belgique, Brussels.

MEASUREMENT OF THE SOLAR CONSTANT

D. Crommelynck *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03B

N82-18254*# Centre National de la Recherche Scientifique, Paris (France).

SOLAR SPECTRUM FROM 170 TO 3200 NANOMETERS

G. Thuiller *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03B

N82-19114# Kiel Univ. (West Germany). Inst. fuer Reine und Angewanndte Kernphysik.

PART 2: THE DEFLEXION OF STARTLIGHT BY THE SUN

In its Relativistic Effects in the Solar System 1981 18 p refs (For primary document see N82-19112 09-88)

Avail: NTIS HC A03/MF A01

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-19129# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

V.L.F. IONOSONDE AND LONG-DISTANCE PROPAGATION ANOMALIES PRODUCED BY GALACTIC CEN X-4 X-RAY BURST IN MAY 1979

Liliaua Rizzo Piazza, Pierre Kaufmann, and P. Ramirez Pardo (Inst. de Atividades Espacias, Blumenau SC, Brazil) Oct. 1981 14 p refs Submitted for publication Sponsored in part by FINEP and FAPESD

(INPE-2250-PRE/033) Avail: NTIS HC A02/MF A01

The galactic X-ray source Cen X-4 produced a large outburst in May 1979, measured by Ariel-5 satellite. Low ionosphere group heights measured daily by a V.L.F. ionosonde indicated anomalous lowering of the effective reflection height in good correlation with Cen X-4 burst, as well as an increase in reflection coefficient, larger for larger frequencies. Diurnal V.L.F. phase variations in a long-distance propagation path presented nighttime 3-4 sigma deviations from average in some days during the Cen X-4 bursting period. These results are a suggested confirmation that galactic transient X-ray sources are capable to produce sufficient ionization effects to be detectable as low ionosphere anomalies. Author

N82-18246*# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.

ISOTOPIC STACK - MEASUREMENT OF HEAVY COSMIC RAY ISOTOPES

R. Beaujean *In* NASA. Marshall Space Flight Center Spacelab Mission 1 Expt. Descriptions Nov. 1981 3 p (For primary document see N82-18234 09-12)

Avail: NTIS HC A08/MF A01 CSCL 03B

99 GENERAL

N82-19130*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

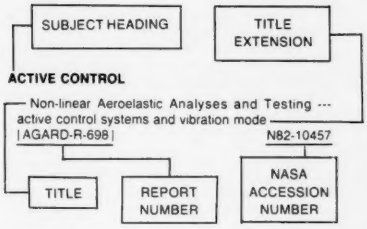
TECHNOLOGY DEVELOPMENT OF THE SPACE TRANSPORTATION SYSTEM MISSION AND TERRESTRIAL APPLICATIONS OF SATELLITE TECHNOLOGY Annual Report

1981 18 p refs

(NASA-TM-84131) Avail: NTIS HC A02/MF A01 CSCL 05A

The Space Transportation System (STS) is discussed, including the launch processing system, the thermal protection subsystem, meteorological research, sound supression water system, rotating service structure, improved hypergol or removal systems, fiber optics research, precision positioning, remote controlled solid rocket booster nozzle plugs, ground operations for Centaur orbital transfer vehicle, parachute drying, STS hazardous waste disposal and recycle, toxic waste technology and control concepts, fast analytical densitometry study, shuttle inventory management system, operational intercommunications system improvement, and protective garment ensemble. Terrestrial applications are also covered, including LANDSAT applications to water resources, satellite freeze forecast system, application of ground penetrating radar to soil survey, turtle tracking, evaluating computer drawn ground cover maps, sparkless load pulsar, and coupling a microcomputer and computing integrator with a gas chromatograph. N.W.

Typical Subject Index Listing



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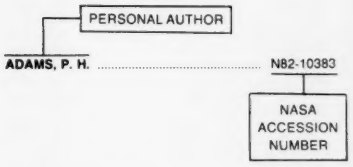

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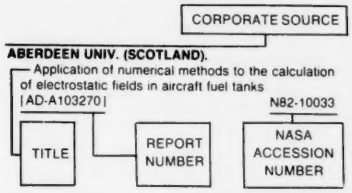

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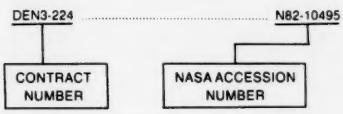

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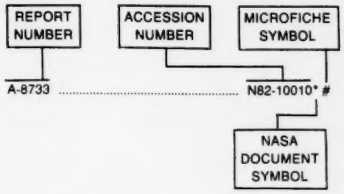

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AD-A108680 N82-19121 #
AD-A108681 N82-18815 #
AD-A108682 N82-18832 #
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AD-A108685 N82-18629 #
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AD-A108694 N82-18886 #
AD-A108700 N82-18667 #
AD-A108710 N82-18373 #
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AD-A108721 N82-18867 #
AD-A108724 N82-18227 #
AD-A108728 N82-18634 #
AD-A108729 N82-18562 #
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AD-A108739 N82-18990 #
AD-A108740 N82-18228 #
AD-A108741 N82-18614 #
AD-A108743 N82-18788 #
AD-A108745 N82-19070 #
AD-A108746 N82-18976 #
AD-A108747 N82-18457 #
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AD-A108751 N82-18458 #
AD-A108752 N82-18217 #
AD-A108753 N82-18628 #
AD-A108754 N82-18654 #
AD-A108755 N82-18999 #
AD-A108756 N82-18810 #
AD-A108819 N82-18892 #
AD-A108820 N82-18891 #
AD-A108822 N82-19013 #
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AD-A108929 N82-18890 #
AD-A108981 N82-18597 #
AD-A109024 N82-18548 #
AD-A109059 N82-18350 #
AD-A109076 N82-18940 #
AD-A109179 N82-18868 #
AD-A109190 N82-18398 #
AD-A109369 N82-18795 #

AD-E500447 N82-18462 #
AD-E500466 N82-18208 #
AD-E950182 N82-18196 #

AEBG-9/81-1568L N82-18135 #

AECL-6476 N82-18638 #
AECL-6853 N82-18637 #
AECL-6883 N82-18379 #
AECL-6961 N82-18639 #

AERE-R-9810 N82-19076 #
AERE-R-9829 N82-18527 #
AERE-R-10042 N82-18372 #

AERE-TP-877 N82-19073 #

AFAMRL-TR-80-140 N82-18192 #
AFAMRL-TR-81-27 N82-18193 #
AFAMRL-TR-81-31 N82-18743 #

AFGL-ERP-736 N82-18812 #
AFGL-ERP-746 N82-18815 #
AFGL-ERP-749 N82-19038 #
AFGL-ERP-750 N82-18813 #
AFGL-ERP-751 N82-19121 #

AFGL-IP-298 N82-18468 #
AFGL-IP-303 N82-18814 #

AFGL-TR-81-0019 N82-18468 #
AFGL-TR-81-0086 N82-18809 #
AFGL-TR-81-0102 N82-18812 #
AFGL-TR-81-0162 N82-18742 #
AFGL-TR-81-0191 N82-18815 #
AFGL-TR-81-0204 N82-18889 #
AFGL-TR-81-0217 N82-19038 #
AFGL-TR-81-0218 N82-18813 #
AFGL-TR-81-0219 N82-18814 #
AFGL-TR-81-0231 N82-19121 #
AFGL-TR-81-0233 N82-18560 #
AFGL-TR-81-0235 N82-18792 #
AFGL-TR-81-0262 N82-18589 #
AFGL-TR-81-0268 N82-18835 #

AFHRL-TP-81-38 N82-18227 #

AFMD-81-104 N82-19091 #

AFOSR-81-0739TR N82-19006 #
AFOSR-81-0748TR N82-18371 #
AFOSR-81-0755TR N82-18953 #
AFOSR-81-0762TR N82-19012 #
AFOSR-81-0764TR N82-18547 #
AFOSR-81-0765TR N82-18855 #
AFOSR-81-0767TR N82-18987 #
AFOSR-81-0768TR N82-18950 #
AFOSR-81-0769TR N82-18323 #
AFOSR-81-0770TR N82-18837 #
AFOSR-81-0773TR N82-18617 #
AFOSR-81-0775TR N82-18525 #
AFOSR-81-0782TR N82-18546 #
AFOSR-81-0785TR N82-18875* #
AFOSR-81-0789TR N82-18594 #
AFOSR-81-0790TR N82-18590 #
AFOSR-81-0791TR N82-18949 #
AFOSR-81-0792TR N82-18937 #
AFOSR-81-0793TR N82-18921 #
AFOSR-81-0795TR N82-18936 #
AFOSR-81-0796TR N82-18563 #
AFOSR-81-0797TR N82-18951 #
AFOSR-81-0800TR N82-18346 #
AFOSR-81-0802TR N82-18883 #
AFOSR-81-0804TR N82-18592 #
AFOSR-81-0806TR N82-18545 #
AFOSR-81-0814TR N82-18350 #
AFOSR-81-0850TR N82-18526 #
AFOSR-81-0852TR N82-18940 #
AFOSR-81-0862TR N82-18597 #

AFRPL-TR-81-70-VOL-1 N82-18319 #
AFRPL-TR-81-70-VOL-2 N82-18320 #
AFRPL-TR-81-70-VOL-3 N82-18321 #
AFRPL-TR-81-79 N82-18588 #

AFSC-TR-81-65 N82-19100 #
AFSC-TR-81-66 N82-19101 #
AFSC-TR-81-67 N82-19102 #

AFWAL-TR-80-1160 N82-18517 #
AFWAL-TR-80-4152 N82-18317 #
AFWAL-TR-81-1142 N82-18197 #
AFWAL-TR-81-1177 N82-18522 #
AFWAL-TR-81-1191 N82-19070 #
AFWAL-TR-81-2096 N82-18992 #
AFWAL-TR-81-3036 N82-18185 #
AFWAL-TR-81-3074 N82-18224 #
AFWAL-TR-81-4044 N82-18636 #
AFWAL-TR-81-4060 N82-18394 #
AFWAL-TR-81-4073 N82-18330 #
AFWAL-TR-81-4080 N82-18614 #
AFWAL-TR-81-4096 N82-18329 #
AFWAL-TR-81-4112 N82-18628 #

AFWL-TR-81-40 N82-18395 #
AFWL-TR-81-3081 N82-19119 #

AI-M-651 N82-18922 #
AI-M-653 N82-18938 #

AIAA-81-2637 N82-18178* #

AMMRC-TR-81-47 N82-18328 #
AMRC-N-167 N82-19006 #

AMSAA-TR-321-VOL-2 N82-18985 #

ANSER-SPDN-80-4 N82-19115 #

ANU-P-771 N82-19018 #
ANU-P-786 N82-19017 #

AP-42-ED-3-SUPPL-1-7/12 N82-18760 #

AR-1 N82-18548 #
AR-002-237 N82-18811 #

ARB-R-81/40 N82-18757 #

ARCSL-CR-81003 N82-19032 #

ARL/MECH/ENG/NOTE-386 N82-18418 #

ARL/PSU/TM-81-156 N82-18524 #
ARL/PSU/TM-81-166 N82-19000 #

ARL/STRUC-384 N82-18811 #

ARO-14740.4-MS N82-18398 #

ASD-TR-81-5030 N82-18210 #

B-80-157/60.7.0157 N82-18225 #

BBN-4444 N82-18743 #

BHT-699-099-111-VOL-2 N82-18231 #

BLG-536 N82-18351 #

BLM/YN/SR-81/02 N82-18800 #

BM-IC-8843 N82-18400 #

BM-OFR-135-81 N82-18685 #

BMFT-FB-T-81-145 N82-18710 #
BMFT-FB-T-81-172 N82-18532 #
BMFT-FB-T-81-175 N82-18552 #
BMFT-FB-T-81-176 N82-18711 #
BMFT-FB-T-81-177 N82-18712 #
BMFT-FB-T-81-178 N82-18713 #
BMFT-FB-T-81-179 N82-18714 #
BMFT-FB-T-81-183 N82-18715 #
BMFT-FB-T-81-184 N82-18716 #
BMFT-FB-T-81-186 N82-18717 #
BMFT-FB-T-81-193 N82-18718 #
BMFT-FB-T-81-194 N82-18514 #

BN-971 N82-18887 #

BONN-HE-80-15 N82-18988 #
BONN-HE-80-16 N82-18989 #

BR77700 N82-18503
BR78251 N82-18539
BR79375 N82-18857
BR79571 N82-18177
BR79940 N82-18505
BR80500 N82-18215
BR80525 N82-18555
BR80598 N82-18657
BR80788 N82-18504
BR81061 N82-18879
BR81100 N82-18447

CCVS74-VSR810 N82-18896 #
CCVS74-VSR825 N82-18899 #
CCVS74-VSR830 N82-18897 #
CCVS74-VSR845 N82-18898 #
CCVS74-VSR865 N82-18900 #

CEA-CONF-5209 N82-19014 #

CEA-N-2150 N82-19015 #
CEA-N-2169 N82-18958 #

CEA-R-5052 N82-19016 #

CETIM-1-4N-12-9 N82-18421 #
CETIM-1-6E-0-60 N82-18420 #
CETIM-11-H-285 N82-19002 #
CETIM-11-L-182 N82-18644 #

CETIM-12-DO-71 ..... N82-18386 #
CETIM-12-G-199 ..... N82-18387 #
CETIM-15-H-194 ..... N82-18622 #

CISE-1695 ..... N82-18357 #
CISE-1711 ..... N82-18598 #
CISE-1713 ..... N82-18529 #

CMS-01-81 ..... N82-18851 #

CMT-18 ..... N82-18476 #

CNES-81/CT/PRT/SST/SM/194 ..... N82-18640 #

CNRS-CPT-80-P-1217 ..... N82-18956 #
CNRS-CPT-80-P-1226 ..... N82-18955 #
CNRS-CPT-80-P-1244 ..... N82-18957 #

CONF-8105104-9 ..... N82-19023 #

COO-1629 ..... N82-18993 #

CRPE-NT-99 ..... N82-18479 #

CRREL-SP-81-25 ..... N82-18417 #

CRREL-SR-81-23 ..... N82-18469 #
CRREL-SR-81-24 ..... N82-18790 #
CRREL-SR-81-26 ..... N82-18342 #
CRREL-SR-81-29 ..... N82-19104 #

CRREL-81-17 ..... N82-18849 #
CRREL-81-19 ..... N82-18664* #

CSIR-ME-1705 ..... N82-18722 #

CSIR-S-234 ..... N82-18431 #

CTH-MATH-1981-14 ..... N82-18962 #

CTH-R-31/1979 ..... N82-18645 #

CTR-3-5-77-208-1 ..... N82-18436 #

CUA/VSL-010781 ..... N82-19013 #

CUED/A-THERMO/TR-15-1981 ..... N82-18607 #

CUED/C-MAT/TR-76-181 ..... N82-18333 #

CUED/C-MATS/TR-74-1981 ..... N82-18331 #
CUED/C-MATS/TR-78-1981 ..... N82-18332 #

CUED/D-SOILS/TR-102-1981 ..... N82-18423 #
CUED/D-SOILS/TR-109-1981 ..... N82-18966 #
CUED/D-SOILS/TR-110-1981 ..... N82-18424 #

CUED/D-STRUCT/TR.88-1981 ..... N82-18610 #

CUED/D-STRUCT/TR-91-1981 ..... N82-18609 #
CUED/D-STRUCT/TR-92-1981 ..... N82-18611 #

CUED/F-CAMS/TR-207-1981 ..... N82-18964 #
CUED/F-CAMS/TR-211-1981 ..... N82-18965 #
CUED/F-CAMS/TR-213-1981 ..... N82-18963 #
CUED/F-CAMS/TR-215-1981 ..... N82-18943 #

CUED/S-STRUCT/TR-89-1981 ..... N82-18608 #

CUMER-81-3 ..... N82-18548 #

C4100-50 ..... N82-18698* #

DE81-029303 ..... N82-18380 #
DE81-030321 ..... N82-19023 #
DE81-030679 ..... N82-18352 #
DE82-000689 ..... N82-18705 #
DE82-000690 ..... N82-18704 #
DE82-000727 ..... N82-18993 #
DE82-001143 ..... N82-18701 #
DE82-001175 ..... N82-19020 #
DE82-001179 ..... N82-19019 #
DE82-001181 ..... N82-19022 #
DE82-001323 ..... N82-18924 #
DE82-001573 ..... N82-19025 #
DE82-001578 ..... N82-18702 #
DE82-001603 ..... N82-18378 #
DE82-001699 ..... N82-18655 #
DE82-001724 ..... N82-19021 #
DE82-001739 ..... N82-18353 #

DE82-001740 ..... N82-18850 #
DE82-001999 ..... N82-18354 #
DE82-002095 ..... N82-18706 #
DE82-002110 ..... N82-18703 #
DE82-002166 ..... N82-19026 #
DE82-002933 ..... N82-19024 #

DFVLR-FB-79-41 ..... N82-18981 #
DFVLR-FB-80-01 ..... N82-18483 #
DFVLR-FB-80-10 ..... N82-18199 #
DFVLR-FB-80-13 ..... N82-18200 #
DFVLR-FB-80-25 ..... N82-18551 #
DFVLR-FB-80-26 ..... N82-18322 #
DFVLR-FB-80-29 ..... N82-18191 #

DFVLR-MITT-79-17 ..... N82-18198 #
DFVLR-MITT-80-07 ..... N82-18190 #
DFVLR-MITT-80-14 ..... N82-18861 #
DFVLR-MITT-80-15 ..... N82-18214 #
DFVLR-MITT-80-16 ..... N82-18484 #
DFVLR-MITT-81-03 ..... N82-18399 #
DFVLR-MITT-81-08 ..... N82-18485 #

DGLR-81-025 ..... N82-18187 #
DGLR-81-026 ..... N82-18188 #
DGLR-81-035 ..... N82-18212 #
DGLR-81-103 ..... N82-18482 #

DMI-CLIMATOL-PAPERS-8 ..... N82-18838 #

DNA-5687F ..... N82-18458 #
DNA-5701T-1 ..... N82-18788 #

DOE/CS-20232/1 ..... N82-18701 #
DOE/CS-30247/1 ..... N82-18703 #

DOE/EIA-11975/T2 ..... N82-18924 #

DOE/ER-1388/504 ..... N82-19021 #
DOE/ER-01388/860 ..... N82-19023 #
DOE/ER-01545/314 ..... N82-19022 #
DOE/ER-01629/T1 ..... N82-18993 #
DOE/ER-02894/1 ..... N82-19024 #
DOE/ER-03342/9 ..... N82-19025 #
DOE/ER-06027/13 ..... N82-19020 #
DOE/ER-10578/1 ..... N82-18354 #
DOE/ER-10583/2 ..... N82-19026 #
DOE/ER-10817/1 ..... N82-19019 #

DOE/ET-10571/4 ..... N82-18378 #
DOE/ET-13148/T1 ..... N82-18352 #
DOE/ET-15324/T2 ..... N82-18380 #
DOE/ET-15416/2-VOL-1 ..... N82-18704 #
DOE/ET-15416/2-VOL-2 ..... N82-18705 #
DOE/ET-17089/T2 ..... N82-18706 #

DOE/EV-10243/1 ..... N82-18655 #
DOE/EV-70029/15 ..... N82-18850 #

DOE/NASA/0100-1 ..... N82-18693* #
DOE/NASA/0149-2 ..... N82-18690* #
DOE/NASA/0180-4 ..... N82-18698* #
DOE/NASA/0224-1-VOL-4 ..... N82-18688* #
DOE/NASA/51040-36 ..... N82-18691* #

DOE/SF-11438/T1-VOL-2 ..... N82-18702 #

DOT-HS-805980-VOL-2 ..... N82-18233 #

DP-1611 ..... N82-18353 #

DRIC-T-6478 ..... N82-18504

DRSMI/RD-81-18-TR ..... N82-18307 #

DRSMI/RG-81-11-TR ..... N82-18196 #

DT-7814-2 ..... N82-18647 #

DTNSRDC-81/070 ..... N82-18634 #

DVFLR-MITT-80-12 ..... N82-18600 #

D6-41185-9 ..... N82-18327* #
D180-25471-1 ..... N82-18873 #
D180-26864-1 ..... N82-18309* #

E-959 ..... N82-18612* #
E-982 ..... N82-18222* #
E-989-81-02 ..... N82-18858* #

E-1047 ..... N82-18694* #
E-1056 ..... N82-18178* #
E-1112 ..... N82-18311* #

ECRC/R-1440 ..... N82-18425 #

EPA-450/4-81-032 ..... N82-18762 #
EPA-460/3-81-026 ..... N82-18864 #
EPA-460/3-81-027 ..... N82-18865 #
EPA-600/1-81-068 ..... N82-18863 #
EPA-600/2-81-106 ..... N82-18362 #
EPA-600/2-81-144 ..... N82-18575 #
EPA-600/2-81-162 ..... N82-18566 #
EPA-600/2-81-167-VOL-1 ..... N82-19110 #
EPA-600/2-81-180 ..... N82-18410 #
EPA-600/2-81-188 ..... N82-18408 #
EPA-600/2-81-189 ..... N82-18756 #
EPA-600/2-81-206 ..... N82-18568 #
EPA-600/2-81-217 ..... N82-18678 #
EPA-600/2-81-221 ..... N82-18411 #
EPA-600/2-81-223 ..... N82-18677 #
EPA-600/2-81-234 ..... N82-18574 #
EPA-600/2-81-242 ..... N82-18422 #
EPA-600/3-81-041 ..... N82-18761 #
EPA-600/4-81-040 ..... N82-18765 #
EPA-600/7-81-003D ..... N82-18753 #
EPA-600/7-81-012D ..... N82-18766 #
EPA-600/7-81-042 ..... N82-18740 #
EPA-600/7-81-043-VOL-2 ..... N82-18442 #
EPA-600/7-81-047 ..... N82-18736 #
EPA-600/7-81-048 ..... N82-18739 #
EPA-600/7-81-050 ..... N82-18738 #
EPA-600/7-81-053 ..... N82-18735 #
EPA-600/7-81-057 ..... N82-18441 #
EPA-600/7-81-058 ..... N82-18737 #
EPA-600/7-81-062 ..... N82-18440 #
EPA-600/7-81-066 ..... N82-18734 #
EPA-600/7-81-068 ..... N82-18679 #
EPA-600/7-81-106A-VOL-1 ..... N82-18752 #
EPA-600/7-81-111A ..... N82-18730 #
EPA-600/7-81-116 ..... N82-18680 #
EPA-600/7-81-142 ..... N82-18751 #
EPA-600/7-81-154 ..... N82-18758 #
EPA-600/7-81-161 ..... N82-18438 #
EPA-600/7-81-162 ..... N82-18414 #
EPA-600/7-81-164 ..... N82-18439 #
EPA-600/7-81-166 ..... N82-18764 #
EPA-600/8-81-020 ..... N82-18750 #
EPA-600/9-81-032 ..... N82-18763 #
EPA-902/4-81-002 ..... N82-18767 #
EPA-906/9-81-003 ..... N82-19111 #

EPA/AA/CTAB/PA/81-16 ..... N82-18412 #

EPL-81-4/ONR-81-4 ..... N82-18867 #

EPRI-NP-81-19-LD ..... N82-18984 #

EPRI-RP-1441-1 ..... N82-18984 #

ER81-4053 ..... N82-18609 #

ESA-CR(P)-1463 ..... N82-18480 #
ESA-CR(P)-1464 ..... N82-18530 #
ESA-CR(P)-1467 ..... N82-18405 #
ESA-CR(P)-1468 ..... N82-18564 #
ESA-CR(P)-1470-VOL-1 ..... N82-18618 #
ESA-CR(P)-1470-VOL-2 ..... N82-18619 #
ESA-CR(P)-1472 ..... N82-19099 #
ESA-CR(P)-1473 ..... N82-18531 #
ESA-CR(P)-1474 ..... N82-18640 #
ESA-CR(P)-1475 ..... N82-18481 #
ESA-CR(P)-1476 ..... N82-18669 #

ESA-TT-667 ..... N82-18198 #
ESA-TT-676 ..... N82-18981 #
ESA-TT-677 ..... N82-18483 #
ESA-TT-680 ..... N82-18190 #
ESA-TT-683 ..... N82-18199 #
ESA-TT-685 ..... N82-18200 #
ESA-TT-689 ..... N82-18600 #
ESA-TT-691 ..... N82-18861 #
ESA-TT-697 ..... N82-18271 #
ESA-TT-700 ..... N82-18382 #
ESA-TT-702 ..... N82-18551 #
ESA-TT-703 ..... N82-18322 #
ESA-TT-705 ..... N82-18214 #
ESA-TT-706 ..... N82-18484 #
ESA-TT-708 ..... N82-18191 #
ESA-TT-715 ..... N82-18796 #

ESA-TT-716 ..... N82-18399 #
ESA/FSLP-EX-001 ..... N82-18234* #
ESD-TR-81-153 ..... N82-18521 #
ESD-TR-81-210 ..... N82-18888 #
ESD-TR-81-289 ..... N82-18476 #
ESS/SS-1006 ..... N82-18564 #
FAA-EM-82-6 ..... N82-18219 #
FAA-G-2100/1B ..... N82-18518 #
FAA-G-2100/2A ..... N82-18518 #
FAA-G-2100/3A ..... N82-18518 #
FAA-G-2100/4B ..... N82-18518 #
FAA-G-2100/5A ..... N82-18518 #
FAA-G-2100C ..... N82-18518 #
FAA-RD-81-48 ..... N82-18230 #
FAA/RD-81/4 ..... N82-18218 #
FCTC/TR-81/22 ..... N82-18895 #
FCTC/TR-81/23 ..... N82-18902 #
FCTC/TR-81/24 ..... N82-18904 #
FCVS78-VSR867 ..... N82-18894 #
FCVS78-VSR871 ..... N82-18903 #
FFA-TN-AU-1661-PT-1 ..... N82-18308 #
FFA-TN-HU-2189-PT-5 ..... N82-18720 #
FFA-TN-HU-2262-PT-1 ..... N82-18798 #
FFA-TN-HU-2262-PT-3 ..... N82-18840 #
FFA-TN-HU-2262-PT-4 ..... N82-18721 #
FFA-134 ..... N82-18719 #
FHWA-CT-81-4 ..... N82-18433 #
FHWA/RD-80/065 ..... N82-18435 #
FHWA/RD-80/172 ..... N82-18427 #
FHWA/RD-81/136 ..... N82-18428 #
FHWA/RD-81/184 ..... N82-18434 #
FHWA/TX-81/13-208-1 ..... N82-18436 #
FOA-A-30027-E2 ..... N82-18490 #
FOA-B-20034-D8 ..... N82-18985 #
FOA-C-20431-T1 ..... N82-19094 #
FOA-C-30240-E1/E3 ..... N82-18672 #
FOA-C-53005-H2 ..... N82-18942 #
FOA-C-54035-H1 ..... N82-18744 #
FOA-C-54036-H1 ..... N82-18745 #
FOA-C-58010-H1 ..... N82-18862 #
FOA-REPTS-VOL-15-NO-4 ..... N82-18985 #
FR-80-39/EE ..... N82-18764 #
FSGTR/INT-112 ..... N82-18360 #
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